

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



See website for details on approvals and standards.

## SA2E/SA1E

Package Quantity: 1

| Sensing Method                                                     |                                                                        |               | Sensing Range                                                                    | Connection | Cable Length (m) | Operation Mode                 | Part No.     |              |
|--------------------------------------------------------------------|------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------|------------|------------------|--------------------------------|--------------|--------------|
|                                                                    |                                                                        |               |                                                                                  |            |                  |                                | NPN Output   | PNP Output   |
| Through-beam                                                       | With Sensitivity Adjustment<br>Red LED                                 |               | <br>* See the characteristics on P18.                                            | Cable      | 2                | Select<br>Light ON/<br>Dark ON | SA2E-TN3-2M  | SA2E-TP3-2M  |
|                                                                    |                                                                        |               |                                                                                  | Connector  | —                |                                | SA2E-TN3C    | SA2E-TP3C    |
| Polarized Retro-reflective                                         | With Sensitivity Adjustment<br>Red LED                                 | <br>(*1) (*2) | <br>* See the characteristics on P19.                                            | Cable      | 2                | Select<br>Light ON/<br>Dark ON | SA2E-PN3-2M  | SA2E-PP3-2M  |
|                                                                    |                                                                        |               |                                                                                  | Connector  | —                |                                | SA2E-PN3C    | SA2E-PP3C    |
| Diffuse-reflective                                                 | With Sensitivity Adjustment<br>Infrared LED<br>Red LED<br>Infrared LED |               | <br>* See the characteristics on P19.                                            | Cable      | 2                | Select<br>Light ON/<br>Dark ON | SA2E-DN3L-2M | SA2E-DP3L-2M |
|                                                                    |                                                                        |               |                                                                                  | Connector  | —                |                                | SA2E-DN3LC   | SA2E-DP3LC   |
|                                                                    |                                                                        |               | <br>* See the characteristics on P19.                                            | Cable      | 2                |                                | SA2E-DN3M-2M | SA2E-DP3M-2M |
|                                                                    |                                                                        |               |                                                                                  | Connector  | —                |                                | SA2E-DN3MC   | SA2E-DP3MC   |
|                                                                    |                                                                        |               | <br>* See the characteristics on P19.                                            | Cable      | 2                |                                | SA2E-DN3S-2M | SA2E-DP3S-2M |
|                                                                    |                                                                        |               |                                                                                  | Connector  | —                |                                | SA2E-DN3SC   | SA2E-DP3SC   |
| Background Suppression (BGS)                                       | With Sensing Range Adjustment<br>Red LED                               |               | <br>Adjustable Sensing Range<br>20 to 350mm<br>* See the characteristics on P20. | Cable      | 2                | Select<br>Light ON/<br>Dark ON | SA2E-BN3-2M  | SA2E-BP3-2M  |
|                                                                    |                                                                        |               |                                                                                  | Connector  | —                |                                | SA2E-BN3C    | SA2E-BP3C    |
| Small-beam Reflective                                              | With Sensitivity Adjustment<br>Red LED                                 |               | <br>* See the characteristics on P19.                                            | Cable      | 2                | Select<br>Light ON/<br>Dark ON | SA2E-NN3-2M  | SA2E-NP3-2M  |
|                                                                    |                                                                        |               |                                                                                  | Connector  | —                |                                | SA2E-NN3C    | SA2E-NP3C    |
| Coaxial Polarized Retro-reflective<br>(Transparent Object Sensing) | With Sensitivity Adjustment<br>Red LED                                 | <br>(*1)      | <br>* See the characteristics on P20.                                            | Cable      | 1                | Light ON                       | SA1E-XN1     | SA1E-XP1     |
|                                                                    |                                                                        |               |                                                                                  |            |                  | Dark ON                        | SA1E-XN2     | SA1E-XP2     |
|                                                                    |                                                                        |               |                                                                                  |            | 2                | Light ON                       | SA1E-XN1-2M  | SA1E-XP1-2M  |
|                                                                    |                                                                        |               |                                                                                  |            |                  | Dark ON                        | SA1E-XN2-2M  | SA1E-XP2-2M  |
|                                                                    |                                                                        |               |                                                                                  |            | 5                | Light ON                       | SA1E-XN1-5M  | SA1E-XP1-5M  |
|                                                                    |                                                                        |               |                                                                                  |            |                  | Dark ON                        | SA1E-XN2-5M  | SA1E-XP2-5M  |
|                                                                    |                                                                        |               |                                                                                  | Connector  | —                | Light ON                       | SA1E-XN1C    | SA1E-XP1C    |
|                                                                    |                                                                        |               |                                                                                  |            |                  | Dark ON                        | SA1E-XN2C    | SA1E-XP2C    |

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

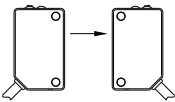
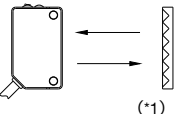
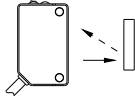
\*2: Reflectors are not supplied and must be ordered separately.

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

## SA1E-L

## Part No.

Package Quantity: 1

| Sensing Method               |           |                            | Sensing Range                                                                                                                                                                                             | Connection | Cable Length (m) | Part No.     |              |
|------------------------------|-----------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|--------------|--------------|
|                              |           |                            |                                                                                                                                                                                                           |            |                  | NPN Output   | PNP Output   |
| Through-beam                 | Red laser | w/Sensitivity Adjustment   | <br>* See the characteristics on P21.                                                                                    | Cable      | 1                | SA1E-LTN3    | SA1E-LTP3    |
|                              |           |                            |                                                                                                                                                                                                           |            | 2                | SA1E-LTN3-2M | SA1E-LTP3-2M |
|                              |           |                            |                                                                                                                                                                                                           |            | 5                | SA1E-LTN3-5M | SA1E-LTP3-5M |
|                              |           |                            |                                                                                                                                                                                                           | Connector  | —                | SA1E-LTN3C   | SA1E-LTP3C   |
| Polarized Retro-reflective   | Red laser | w/Sensitivity Adjustment   | <br>10m (300mm)<br>When using IAC-R5/R8<br>10m (300mm)<br>When using IAC-R9<br>(*1)<br>* See the characteristics on P21. | Cable      | 1                | SA1E-LPN3    | SA1E-LPP3    |
|                              |           |                            |                                                                                                                                                                                                           |            | 2                | SA1E-LPN3-2M | SA1E-LPP3-2M |
|                              |           |                            |                                                                                                                                                                                                           |            | 5                | SA1E-LPN3-5M | SA1E-LPP3-5M |
|                              |           |                            |                                                                                                                                                                                                           | Connector  | —                | SA1E-LPN3C   | SA1E-LPP3C   |
| Background Suppression (BgS) | Red laser | w/Sensing Range Adjustment | <br>20 to 300 mm<br>Adjustable Sensing Range<br>40 to 300mm<br>* See the characteristics on P22.                       | Cable      | 1                | SA1E-LBN3    | SA1E-LBP3    |
|                              |           |                            |                                                                                                                                                                                                           |            | 2                | SA1E-LBN3-2M | SA1E-LBP3-2M |
|                              |           |                            |                                                                                                                                                                                                           |            | 5                | SA1E-LBN3-5M | SA1E-LBP3-5M |
|                              |           |                            |                                                                                                                                                                                                           | Connector  | —                | SA1E-LBN3C   | SA1E-LBP3C   |

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

## SA2E/SA1E

## Specifications

|                           |                 | Through-beam                                                                                                                                                                                                                      | Polarized Retro-reflective                                                                           |
|---------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Part No.                  |                 | SA1E-T□                                                                                                                                                                                                                           | SA2E-P□                                                                                              |
| Power Voltage             |                 | 12 to 24V DC (Operating range: 10 to 30V DC) equipped with reverse-polarity protection                                                                                                                                            |                                                                                                      |
| Current Draw              |                 | Projector: 20mA maximum<br>Receiver: 20mA maximum                                                                                                                                                                                 | 20mA maximum                                                                                         |
| Sensing Range             |                 | 20m                                                                                                                                                                                                                               | 5.0 m (IAC-R5/R8)<br>3.0 m (IAC-R6)<br>2.0 m (IAC-RS2)<br>1.3 m (IAC-RS1)<br>1.6 m (IAC-R7□)<br>(*1) |
| Adjustable Sensing Range  |                 | —                                                                                                                                                                                                                                 |                                                                                                      |
| Detectable Object         |                 | Opaque                                                                                                                                                                                                                            |                                                                                                      |
| Hysteresis                |                 | —                                                                                                                                                                                                                                 | 20% maximum                                                                                          |
| Response Time             |                 | 0.5ms maximum                                                                                                                                                                                                                     | 0.5 ms maximum                                                                                       |
| Sensitivity Adjustment    |                 | Single-turn control (approx. 240°)                                                                                                                                                                                                |                                                                                                      |
| Sensing Range Adjustment  |                 | —                                                                                                                                                                                                                                 |                                                                                                      |
| Light Source Element      |                 | Red LED                                                                                                                                                                                                                           | Red LED                                                                                              |
| Operation Mode            |                 | Light ON/Dark ON (select using the Operation Mode Switch)                                                                                                                                                                         |                                                                                                      |
| Control Output            |                 | NPN open collector or PNP open collector (30V DC, 100 mA maximum with short circuit protection circuit)<br><br>Voltage drop:<br>2V max. (30V DC, 100mA)<br>1.2V max. (30V DC, 10mA)<br>Output Reverse-polarity Protection Circuit |                                                                                                      |
| LED Indicators            |                 | Operation LED: Amber<br>Stable LED: Green, Power LED: Green (Through-beam type projector)                                                                                                                                         |                                                                                                      |
| Interference Prevention   |                 | —                                                                                                                                                                                                                                 | Two units can be mounted in close proximity.                                                         |
| Degree of Protection      |                 | IP67 (IEC60529)                                                                                                                                                                                                                   |                                                                                                      |
| Extraneous Light Immunity |                 | Sunlight: 40,000 lux maximum, Incandescent lamp: 10,000 lux maximum (at receiver)                                                                                                                                                 |                                                                                                      |
| Operating Temperature     |                 | -30 to +55°C (no freezing)                                                                                                                                                                                                        |                                                                                                      |
| Operating Humidity        |                 | 35 to 95% RH (no condensation)                                                                                                                                                                                                    |                                                                                                      |
| Storage Temperature       |                 | -40 to +70°C (no freezing)                                                                                                                                                                                                        |                                                                                                      |
| Insulation Resistance     |                 | Between live part and mounting bracket: 20 MΩ minimum (500V DC megger)                                                                                                                                                            |                                                                                                      |
| Dielectric Strength       |                 | 1,000V AC, 50/60 Hz, 1 minute (between live part and mounting bracket)                                                                                                                                                            |                                                                                                      |
| Vibration Resistance      |                 | 10 to 55 Hz, amplitude 1.5mm<br>55 to 500 Hz, acceleration 90m/s <sup>2</sup><br>1 cycle 5 mins<br>30 mins in each of 3 axes                                                                                                      |                                                                                                      |
| Shock Resistance          |                 | 1000m/s <sup>2</sup><br>3 shocks in 6 directions on 3 axes                                                                                                                                                                        |                                                                                                      |
| Material                  | Case            | PBT                                                                                                                                                                                                                               |                                                                                                      |
|                           | Lens            | PMMA                                                                                                                                                                                                                              |                                                                                                      |
|                           | Indicator Model | PC                                                                                                                                                                                                                                |                                                                                                      |
| Weight (approx.)          | Cable Type      | Projector: 50g, Receiver: 50g (*2)                                                                                                                                                                                                | 50g                                                                                                  |
|                           | Connector Type  | Projector: 10g, Receiver: 10g                                                                                                                                                                                                     | 20g                                                                                                  |
| Connection Method         | Cable Type      | ø3.5mm, 3-core (2-core for through-beam), 0.2mm <sup>2</sup> , vinyl cabtyre cable                                                                                                                                                |                                                                                                      |
|                           | Connector Type  | M8 connector (4-pin)                                                                                                                                                                                                              |                                                                                                      |

\*1: Maintain at least the distance shown below between the photoelectric switch and reflector.

IAC-R5/R6/R8: 50mm, IAC-R7: 100mm, IAC-RS1/RS2: 150mm

The detection distance cannot be guaranteed if the reflector is deformed or the reflector tape is applied on an uneven surface.

\*2: Cable length: 2m (30g when the cable length is 1m. 110g when the cable length is 5m.)

## SA2E/SA1E

## Specifications

|                           |                 | Diffuse-reflective                                                                                                 |                                       |                                    | Background Suppression (BGS)                | Small-beam Reflective                       | Coaxial Polarized Retro-reflective (Transparent Object Sensing)                  |
|---------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------|
|                           |                 | Short Distance                                                                                                     | Medium Distance                       | Long Distance                      |                                             |                                             |                                                                                  |
| Part No.                  |                 | SA2E-D□3S                                                                                                          | SA2E-D□3M                             | SA2E-D□3L                          | SA2E-B□                                     | SA2E-N□                                     | SA1E-X□                                                                          |
| Power Voltage             |                 | 12 to 24V DC (Operating range: 10 to 30V DC) equipped with reverse-polarity protection                             |                                       |                                    |                                             |                                             |                                                                                  |
| Current Draw              |                 | 20mA maximum                                                                                                       |                                       |                                    |                                             |                                             |                                                                                  |
| Sensing Range             |                 | 100mm (using 200 × 200mm white paper)                                                                              | 500mm (using 200 × 200mm white paper) | 1m (using 200 × 200mm white paper) | 10 to 350mm (using 200 × 200mm white paper) | 50 to 150mm (using 100 × 100mm white paper) | 2m (using IAC-R9)                                                                |
| Adjustable Sensing Range  |                 | —                                                                                                                  |                                       |                                    | 20 to 350mm (using 200 × 200mm white paper) | —                                           |                                                                                  |
| Detectable Object         |                 | Opaque/transparent                                                                                                 |                                       |                                    | Opaque                                      | Opaque/transparent                          | Opaque/transparent/mirror                                                        |
| Hysteresis                |                 | 20% maximum                                                                                                        |                                       |                                    | 5% maximum                                  | 20% maximum                                 | —                                                                                |
| Response Time             |                 | 0.5ms maximum                                                                                                      |                                       |                                    |                                             |                                             |                                                                                  |
| Sensitivity Adjustment    |                 | Adjustable using a control (approx. 240°)                                                                          |                                       |                                    | —                                           | Adjustable using a control (approx. 240°)   |                                                                                  |
| Sensing Range Adjustment  |                 | —                                                                                                                  |                                       |                                    | Approx. 7-turn endless control              | —                                           |                                                                                  |
| Light Source Element      |                 | Infrared LED                                                                                                       | Red LED                               | Infrared LED                       | Red LED                                     |                                             |                                                                                  |
| Operation Mode            |                 | Light ON/Dark ON (selectable)<br>(select with the Operation Mode Switch)                                           |                                       |                                    |                                             |                                             | Light ON/Dark ON<br>(select by Part No.)                                         |
| Control Output            |                 | NPN open collector or PNP open collector (30V DC, 100mA maximum with short circuit protection circuit)             |                                       |                                    |                                             |                                             |                                                                                  |
|                           |                 | Voltage drop:<br>2V max. (30V DC, 100mA)<br>1.2V max. (30V DC, 10mA)<br>Output Reverse-polarity Protection Circuit |                                       |                                    |                                             |                                             | Voltage drop: 2V max.<br>(30V DC, 100mA)                                         |
| LED Indicators            |                 | Operation LED: Amber<br>Stable LED: Green                                                                          |                                       |                                    |                                             |                                             | Operation LED: Yellow                                                            |
| Interference Prevention   |                 | Two units can be mounted in close proximity.                                                                       |                                       |                                    |                                             |                                             |                                                                                  |
| Degree of Protection      |                 | IP67 (IEC60529)                                                                                                    |                                       |                                    |                                             |                                             |                                                                                  |
| Extraneous Light Immunity |                 | Sunlight: 40,000 lux maximum, Incandescent lamp: 10,000 lux maximum (at receiver)                                  |                                       |                                    |                                             |                                             | Sunlight: 10,000 lux maximum, Incandescent lamp: 5,000 lux maximum (at receiver) |
| Operating Temperature     |                 | -30 to +55°C (no freezing)                                                                                         |                                       |                                    |                                             |                                             | -25 to +55°C (no freezing)                                                       |
| Operating Humidity        |                 | 35 to 95% RH (no condensation)                                                                                     |                                       |                                    |                                             |                                             |                                                                                  |
| Storage Temperature       |                 | -40 to +70°C (no freezing)                                                                                         |                                       |                                    |                                             |                                             |                                                                                  |
| Insulation Resistance     |                 | Between live part and mounting bracket: 20 MΩ minimum (500V DC megger)                                             |                                       |                                    |                                             |                                             |                                                                                  |
| Dielectric Strength       |                 | 1,000V AC, 50/60 Hz, 1 minute (between live part and mounting bracket)                                             |                                       |                                    |                                             |                                             |                                                                                  |
| Vibration Resistance      |                 | 10 to 55 Hz, amplitude 1.5mm<br>55 to 500 Hz, acceleration 90m/s²<br>1 cycle 5 mins<br>30 mins in each of 3 axes   |                                       |                                    |                                             |                                             | 10 to 55 Hz, amplitude 1.5mm<br>1 cycle 5 mins<br>30 mins in each of 3 axes      |
| Shock Resistance          |                 | 1000m/s²<br>3 shocks in 6 directions on 3 axes                                                                     |                                       |                                    |                                             |                                             | 500m/s²<br>3 shocks in 6 directions on 3 axes                                    |
| Material                  | Case            | PBT                                                                                                                |                                       |                                    |                                             |                                             | PC/PBT                                                                           |
|                           | Lens            | PMMA                                                                                                               |                                       |                                    |                                             |                                             |                                                                                  |
|                           | Indicator Model | PC                                                                                                                 |                                       |                                    |                                             |                                             |                                                                                  |
| Weight (approx.)          | Cable Type      | 50g                                                                                                                |                                       |                                    |                                             |                                             | 55g (*1)                                                                         |
|                           | Connector Type  | 20g                                                                                                                |                                       |                                    |                                             |                                             |                                                                                  |
| Connection Method         | Cable Type      | ø3.5mm, 3-core, 0.2mm², vinyl cabtyre cable                                                                        |                                       |                                    |                                             |                                             | 20g                                                                              |
|                           | Connector Type  | M8 connector (4-pin)                                                                                               |                                       |                                    |                                             |                                             |                                                                                  |

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

## SA1E-L

## Specifications

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

\*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.)

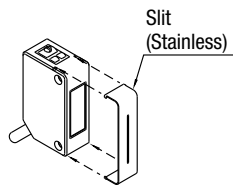
## SA2E/SA1E/SA1E-L

## Slit and Sensing Range (typical) [Through-beam SA2E-T□]

| Slit     |                          | With Sensitivity Adjustment |                                 |                                           |                                 |
|----------|--------------------------|-----------------------------|---------------------------------|-------------------------------------------|---------------------------------|
|          |                          | Sensing Range (m)           |                                 | Minimum Detectable Object Width (mm) (*1) |                                 |
| Part No. | Slit Width: A (See P26.) | Attached on: Receiver       | Attached on: Receiver/Projector | Attached on: Receiver                     | Attached on: Receiver/Projector |
| SA9Z-S06 | 0.5mm                    | 2.5                         | 1.0                             | 0.5                                       | 0.5                             |
| SA9Z-S07 | 1.0mm                    | 3.5                         | 1.5                             | 1.0                                       | 1.0                             |
| SA9Z-S08 | 2.0mm                    | 6.0                         | 3.5                             | 2.0                                       | 2.0                             |
| SA9Z-S09 | 0.5mm                    | 2.0                         | 0.7                             | 0.5                                       | 0.5                             |
| SA9Z-S10 | 1.0mm                    | 3.0                         | 1.5                             | 1.0                                       | 1.0                             |
| SA9Z-S11 | 2.0mm                    | 5.5                         | 3.0                             | 2.0                                       | 2.0                             |
| SA9Z-S12 | 0.5mm                    | 0.8                         | 0.08                            | 0.5                                       | 0.5                             |
| SA9Z-S13 | 1.0mm                    | 1.5                         | 0.3                             | 1.0                                       | 1.0                             |
| SA9Z-S14 | 2.0mm                    | 2.5                         | 1.2                             | 2.0                                       | 2.0                             |

\*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.



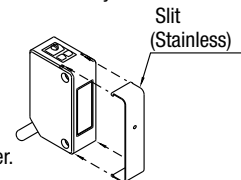
Horizontal slits and round slits have an orientation.  
Make sure that the TOP marking comes on top of the sensor (LED side).

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

| Slit     |               | Sensing Range (m) | Minimum Detectable Object Width (mm) |
|----------|---------------|-------------------|--------------------------------------|
| Part No. | Slit Width: A | Used on receiver  | Used on receiver                     |
| SA9Z-S12 | 0.5mm         | 6                 | 1.1                                  |
| SA9Z-S13 | 1.0mm         | 10                | 1.6                                  |
| SA9Z-S14 | 2.0mm         | 22                | 2.5                                  |

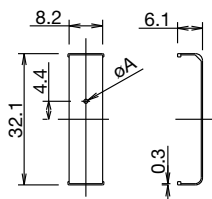
- When slit is mounted only on the receiver (when mounting on one side).
- Minimum detectable object width (mm): when the object is at the intermediate point between the projector and receiver.

The slit can be snapped onto the front easily.



## Dimensions

All dimensions in mm



Material: Stainless Steel

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

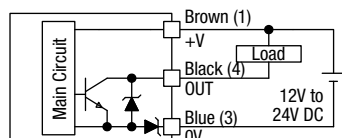
# SA2E/SA1E/SA1E-L

## Output Circuit & Wiring Diagram

### SA2E

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

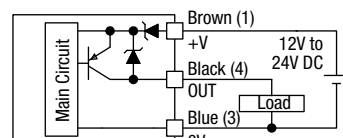
#### NPN Output



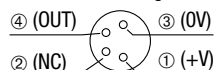
Connector Pin Assignment



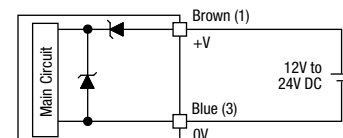
#### PNP Output



Connector Pin Assignment



#### Through-beam Projector

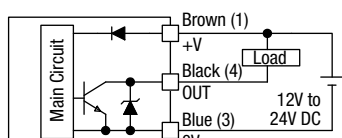


Connector Pin Assignment



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

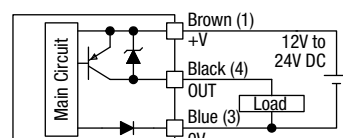
#### NPN Output



Connector Pin Assignment



#### PNP Output

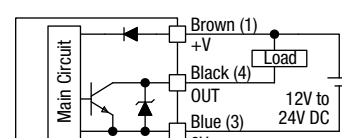


Connector Pin Assignment

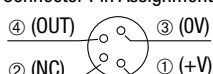


### SA1E-L

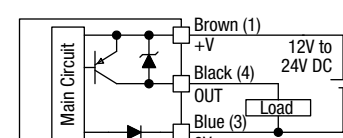
#### NPN Output



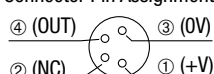
Connector Pin Assignment



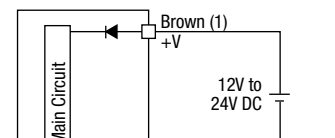
#### PNP Output



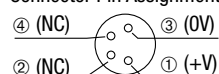
Connector Pin Assignment



#### Through-beam Projector



Connector Pin Assignment



### Dimensions (SA2E/SA1E)

All dimensions in mm.

### Cable Type

### Through-beam (SA2E-T)

### Polarized Retro-reflective (SA2E-P)

### Diffuse-reflective (SA2E-D)

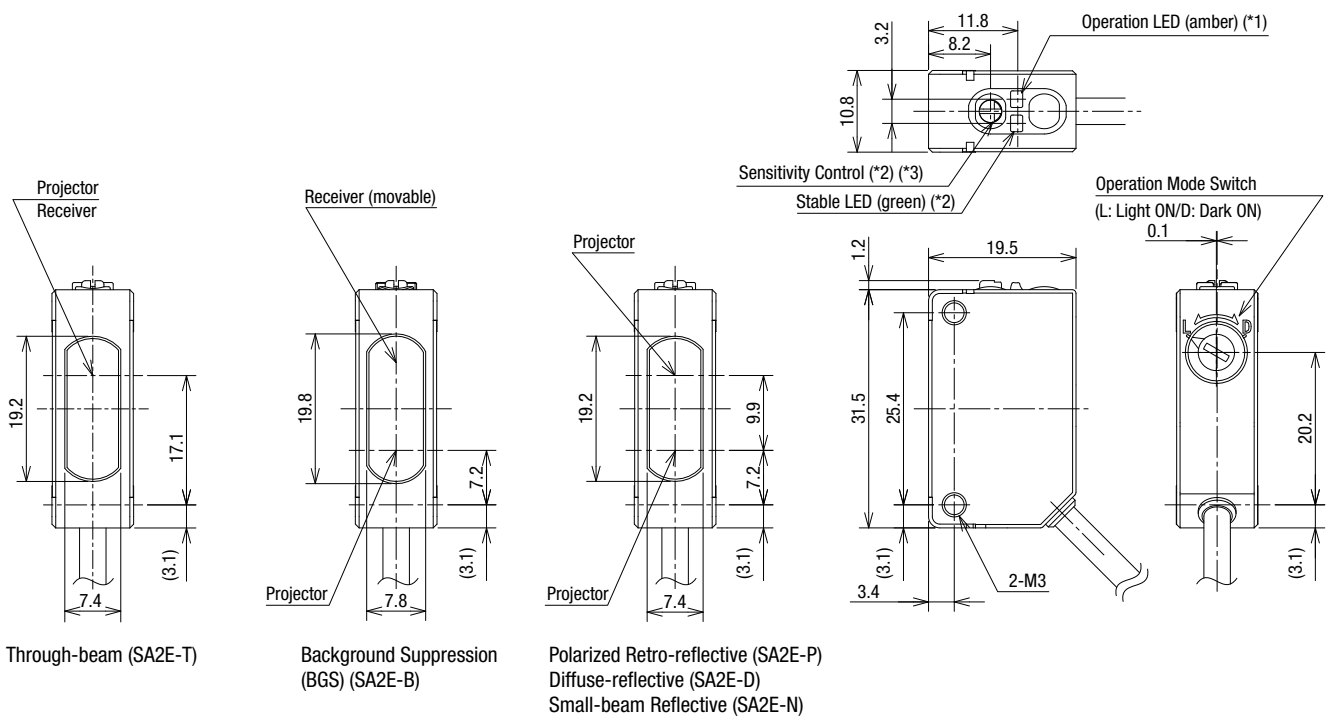
### Background Suppression (BGS) (SA2E-B)

### Small-beam Reflective (SA2E-N)

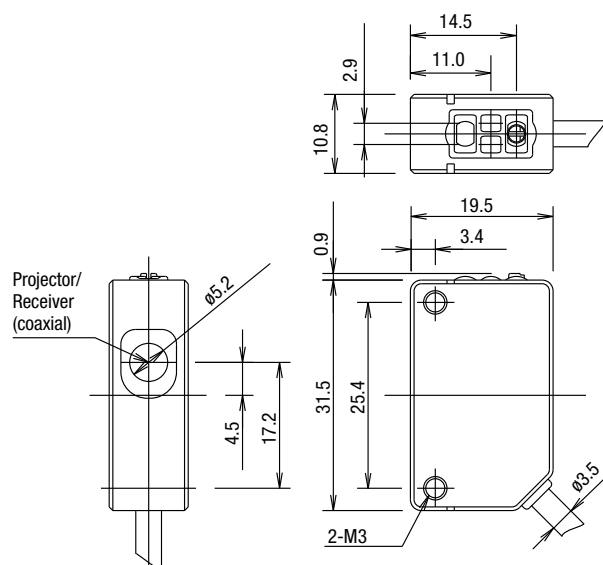
\*1: LED power indicator (green) for SA2E-T through-beam.

\*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).



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



## Dimensions (SA2E/SA1E)

All dimensions in mm.

### Connector Type

Through-beam (SA2E-T)

Polarized Retro-reflective (SA2E-P)

Diffuse-reflective (SA2E-D)

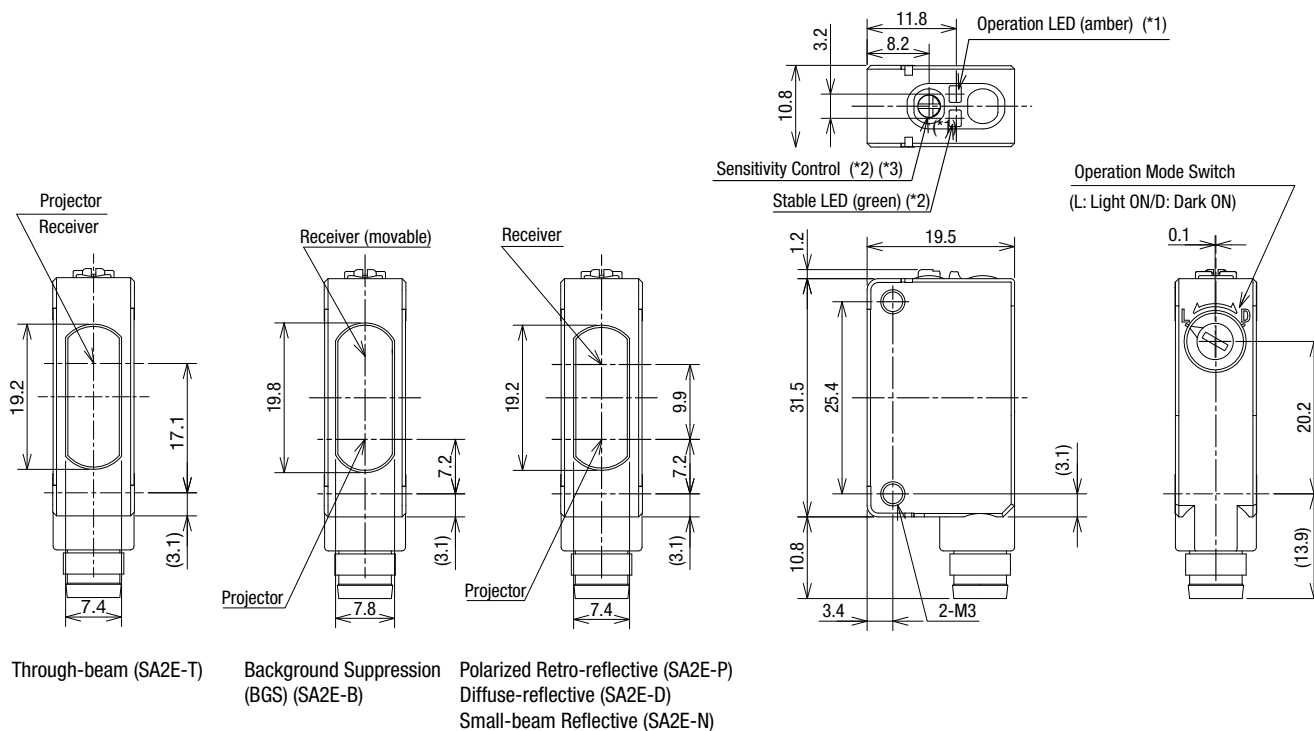
Background Suppression (BGS) (SA2E-B)

Small-beam Reflective (SA2E-N)

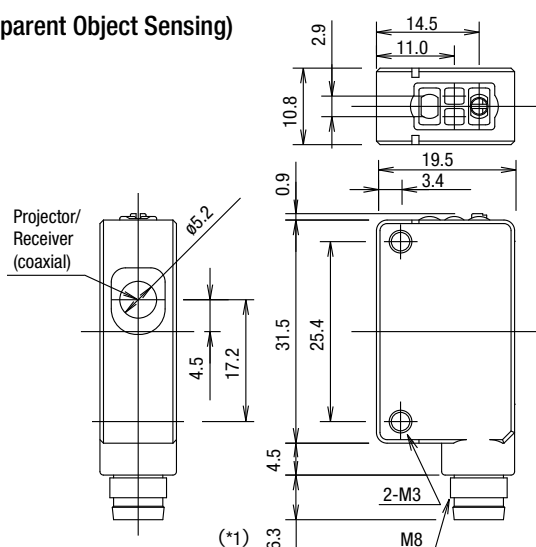
\*1: LED power indicator (green) for SA2E-T through-beam.

\*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)



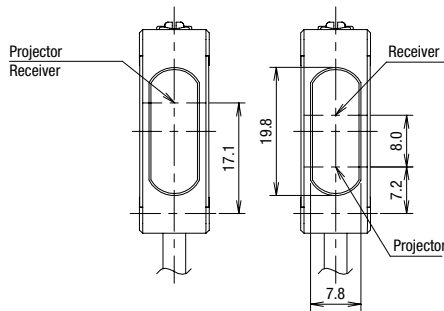
\*1: The connector length is 18 mm when a right-angle connector cable (SA9Z-CM8K-4L□) is attached.

## Dimensions (SA1E-L)

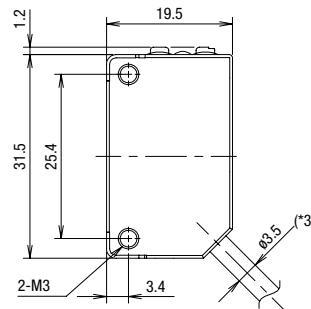
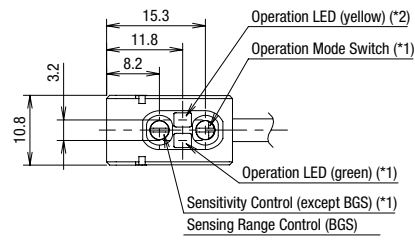
All dimensions in mm.

### Cable Type

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

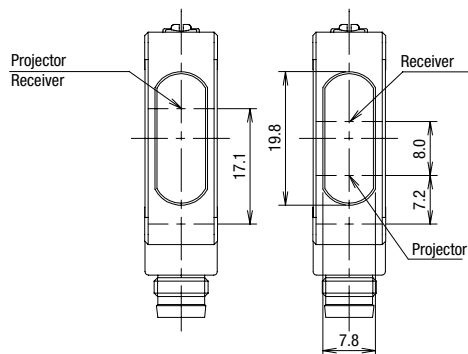


Through-beam (SA1E-LT)

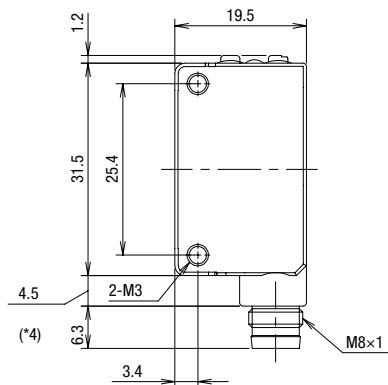
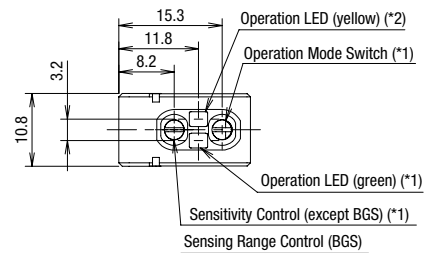


### Connector Type

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



Through-beam (SA1E-LT)



\*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.

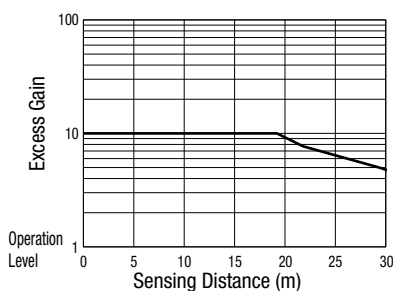
\*3: Cable length depends on models.

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

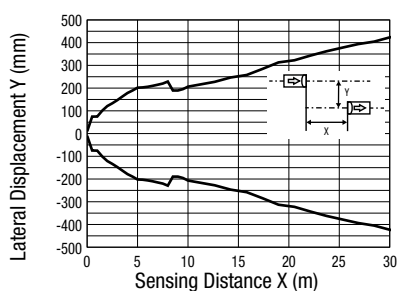
# Characteristics (Typical) (SA2E)

## (1) Through-beam SA1E-T□

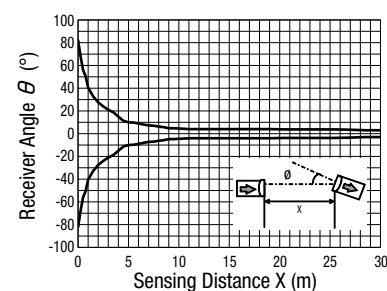
Excess Gain vs. Sensing Distance (Without slit)



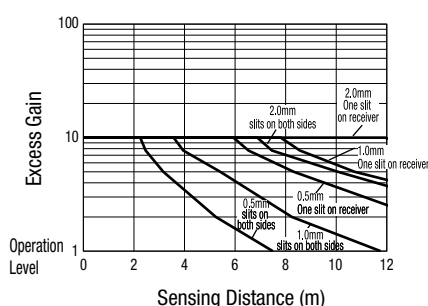
Lateral Displacement (Without slit)



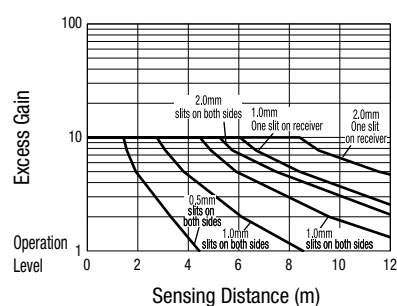
Angle (Without slit)



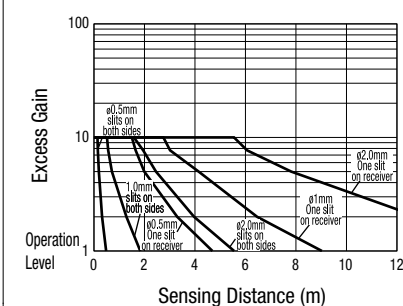
Excess Gain vs. Sensing Distance (With vertical slit)



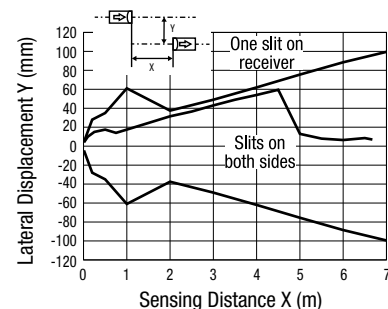
Excess Gain vs. Sensing Distance (With horizontal slit)



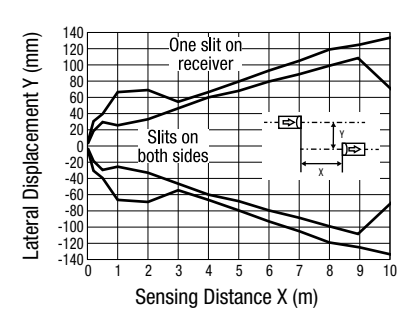
Excess Gain vs. Sensing Distance (With round slit)



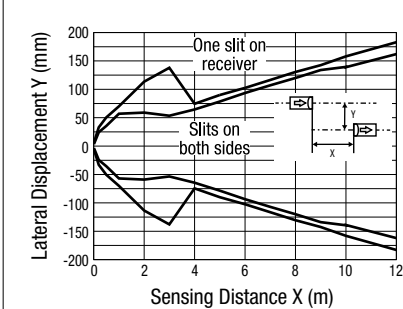
Lateral Displacement (With 0.5-mm vertical slit)



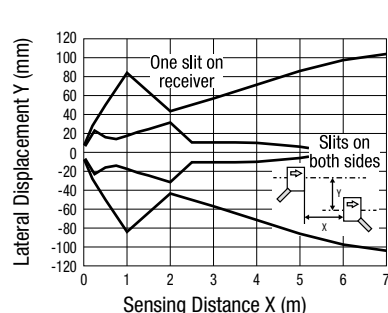
Lateral Displacement (With 1.0-mm vertical slit)



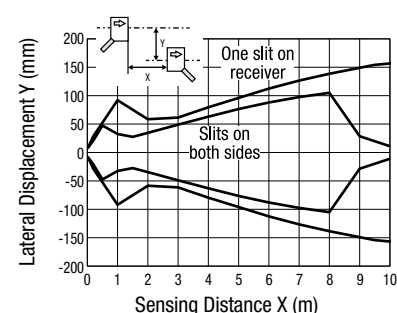
Lateral Displacement (With 2.0-mm vertical slit)



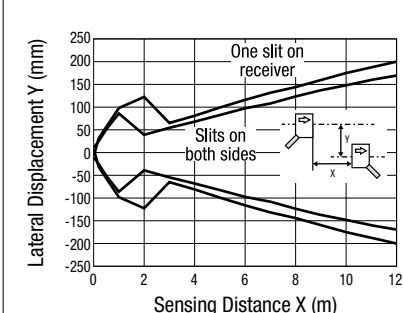
Lateral Displacement (With 0.5-mm horizontal slit)



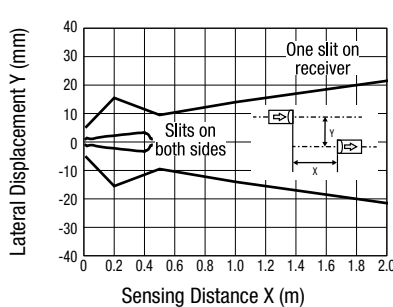
Lateral Displacement (With 1.0-mm horizontal slit)



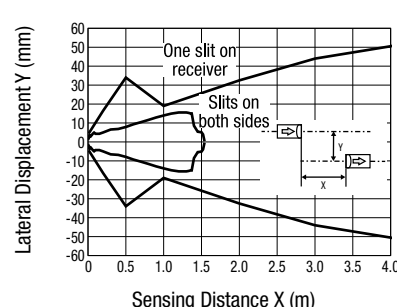
Lateral Displacement (With 2.0-mm horizontal slit)



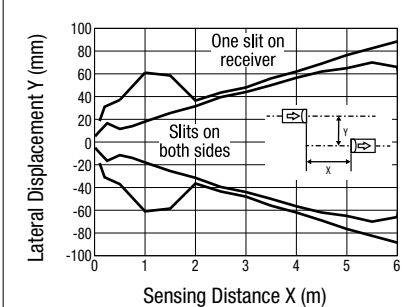
Lateral Displacement (With ø0.5-mm round slit)



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



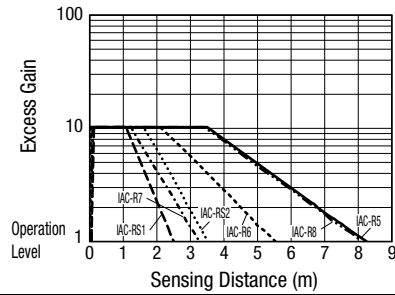
Lateral Displacement (With ø2.0-mm round slit)



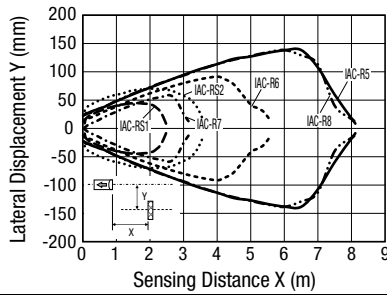
## Characteristics (Typical) (SA2E)

### (2) Polarized Retro-reflective SA2E-P□

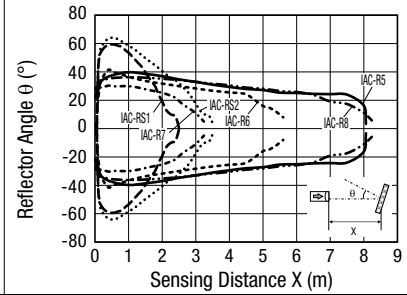
Excess Gain vs. Sensing Distance



Operating Area

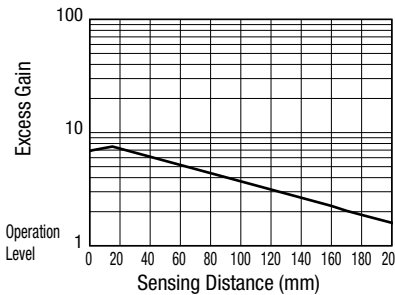


Angle

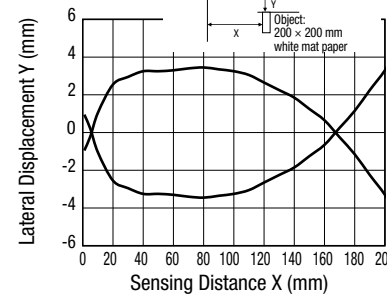


### (3) Diffuse-reflective SA2E-DS□ (100mm)

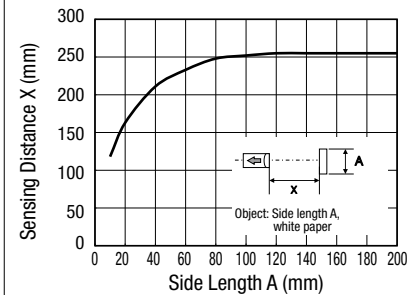
Excess Gain vs. Sensing Distance



Operating Area

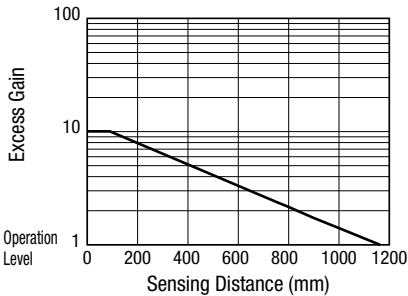


Sensing Distance vs. Object Size

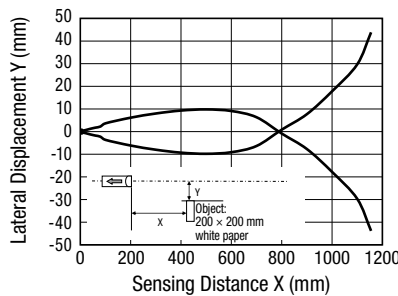


### (4) Diffuse-reflective SA2E-DM□ (500mm)

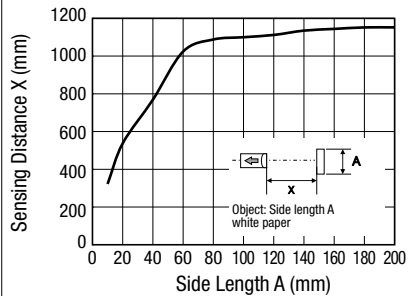
Excess Gain vs. Sensing Distance



Operating Area

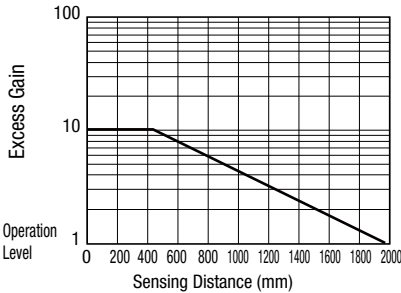


Sensing Distance vs. Object Size

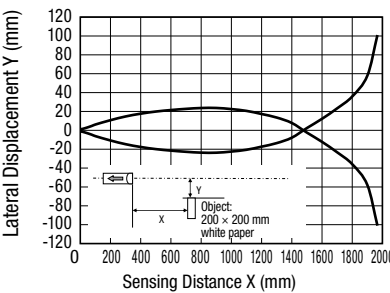


### (5) Diffuse-reflective SA2E-DL□ (1m)

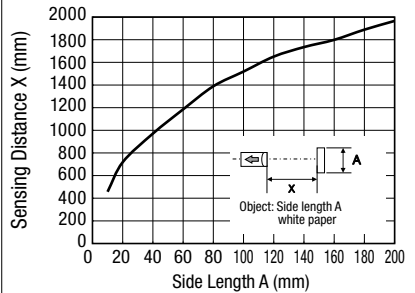
Excess Gain vs. Sensing Distance



Operating Area

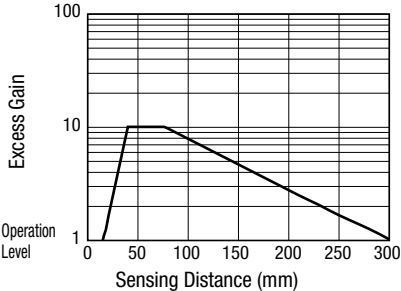


Sensing Distance

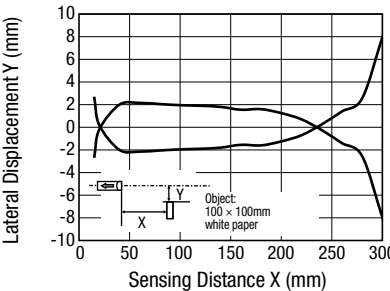


### (6) Small-beam Reflective SA2E-N□

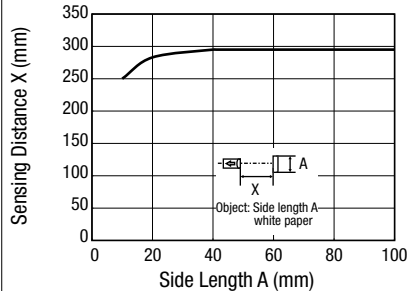
Excess Gain vs. Sensing Distance



Operating Area



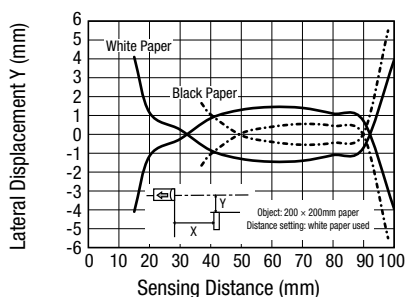
Sensing Area vs. Object Size



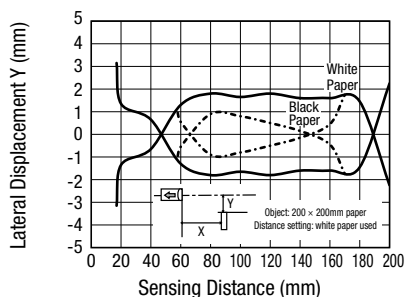
## Characteristics (SA2E/SA1E)

### (7) Background Suppression (BGS) SA2E-B□

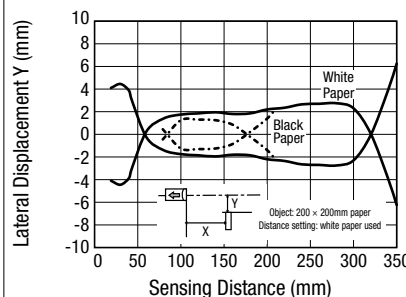
Operating Area (Preset 100 mm)



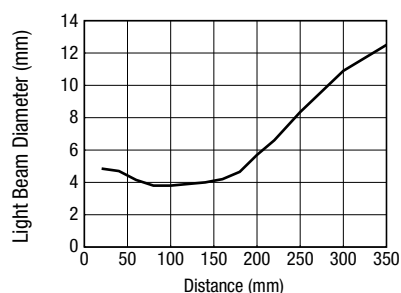
Operating Area (Preset 200 mm)



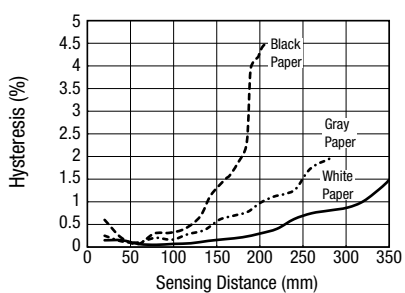
Operating Area (Preset 350 mm)



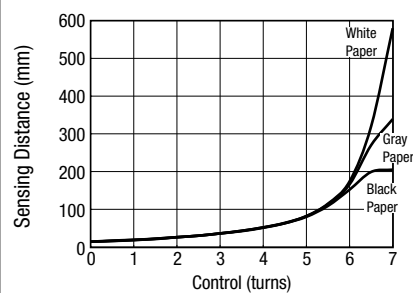
Light Beam Diameter vs. Sensing Distance



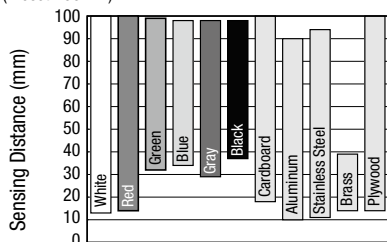
Hysteresis vs. Sensing Distance



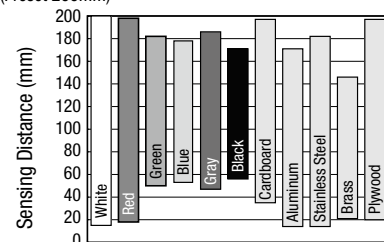
Sensing Distance vs. Control (turns)



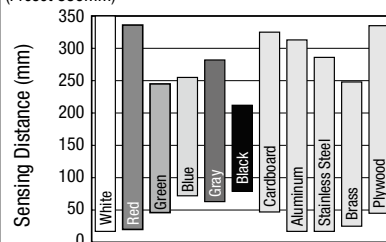
Color (200×200mm paper), material vs. Sensing Distance (Preset 100mm)



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

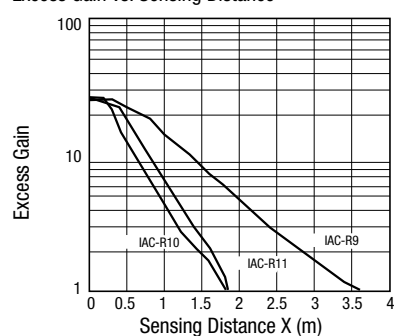


Color (200×200mm paper), material vs. Sensing Distance (Preset 350mm)

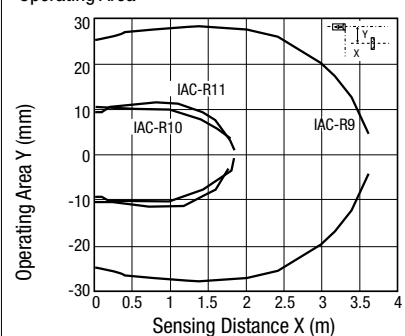


### (8) Coaxial Polarized Retro-reflective (Transparent Object Sensing) (SA1E-X□)

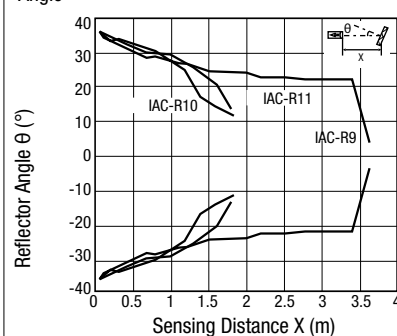
Excess Gain vs. Sensing Distance



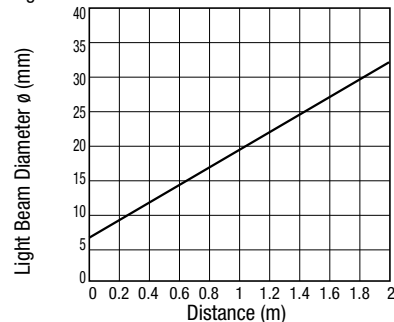
Operating Area



Angle



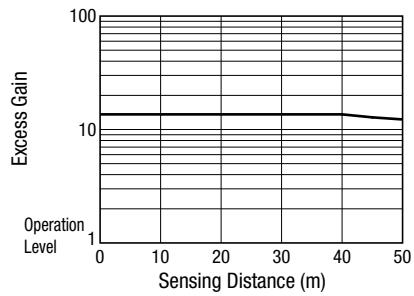
Light Beam Diameter vs. Distance



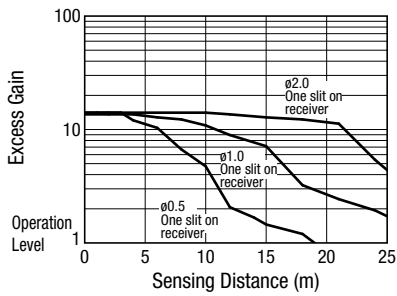
## Characteristics (Typical) (SA1E-L)

### (1) Through-beam SA1E-LT□

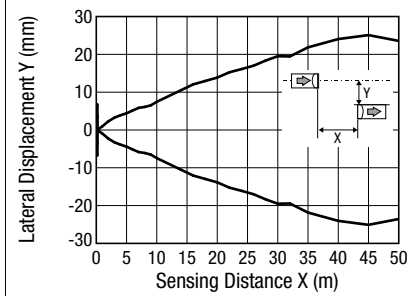
Excess Gain (Without slit)



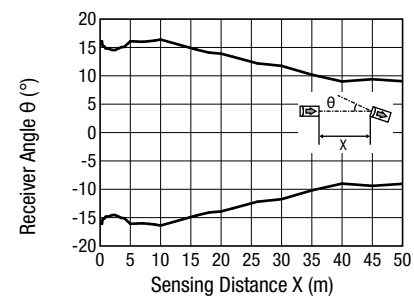
Excess Gain (With slit)



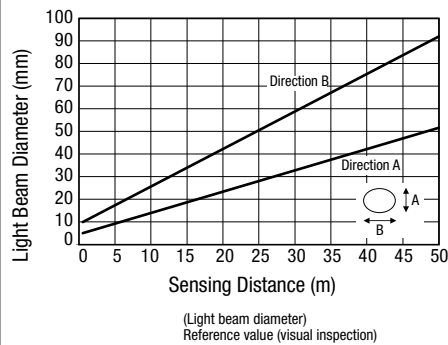
Lateral Displacement (Without slit)



Angle (without slit)

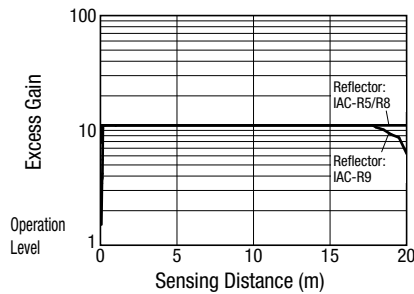


Light Beam Diameter

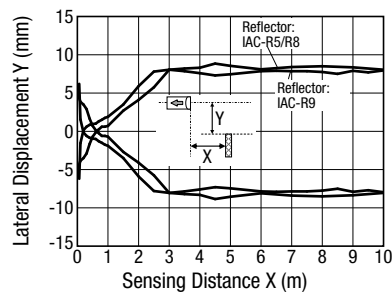


### (2) Polarized Retro-reflective SA1E-LP□

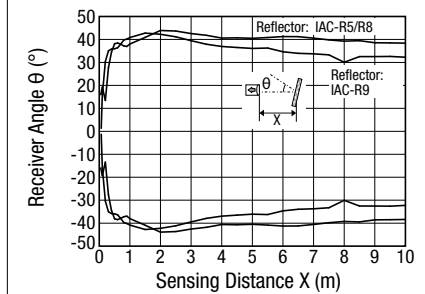
Excess Gain



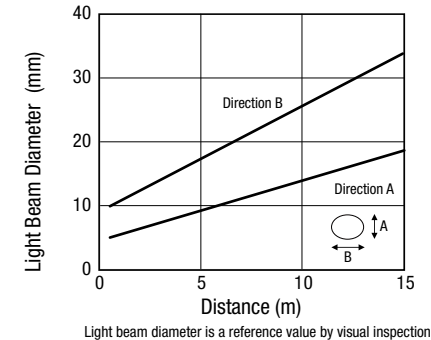
Lateral Displacement



Angle



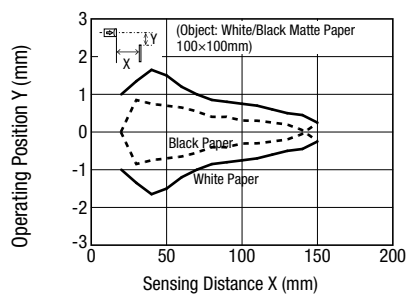
Light Beam Diameter



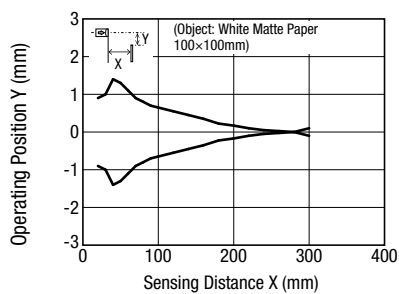
## Characteristics (Typical) (SA1E-L)

### (3) Background Suppression (BGS) SA1E-LB□

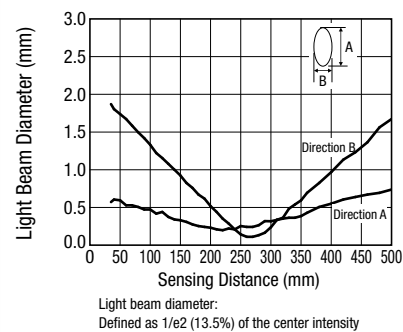
Operating Area (Preset 150mm)



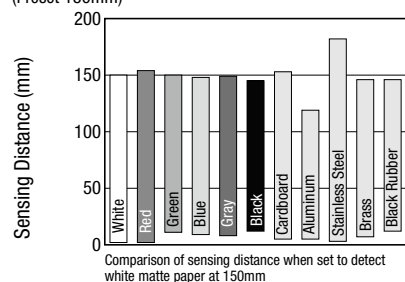
Operating Area (Preset 300mm)



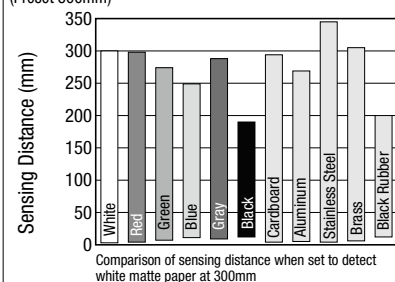
Light Beam Diameter



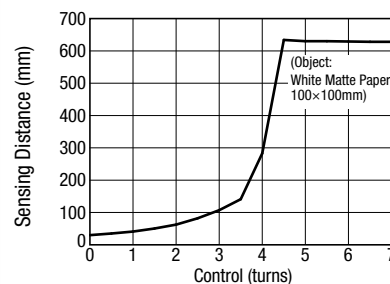
Color (100×100mm matte paper), material vs. Sensing Distance (Preset 150mm)



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



Sensing Distance vs. Control (turns)



## Accessories (SA2E/SA1E) (optional)

## Slits (for through-beam)

When ordering, specify the Ordering No.

| Item            | Slit Size     | Part No. | Ordering No. | Package Quantity |
|-----------------|---------------|----------|--------------|------------------|
| Vertical Slit   | 0.5mm × 18mm  | SA9Z-S06 | SA9Z-S06PN02 | 2                |
|                 | 1.0mm × 18mm  | SA9Z-S07 | SA9Z-S07PN02 |                  |
|                 | 2.0mm × 18mm  | SA9Z-S08 | SA9Z-S08PN02 |                  |
| Horizontal Slit | 0.5mm × 6.5mm | SA9Z-S09 | SA9Z-S09PN02 |                  |
|                 | 1.0mm × 6.5mm | SA9Z-S10 | SA9Z-S10PN02 |                  |
|                 | 2.0mm × 6.5mm | SA9Z-S11 | SA9Z-S11PN02 |                  |
| Round Slit      | Ø0.5mm        | SA9Z-S12 | SA9Z-S12PN02 |                  |
|                 | Ø1.0mm        | SA9Z-S13 | SA9Z-S13PN02 |                  |
|                 | Ø2.0mm        | SA9Z-S14 | SA9Z-S14PN02 |                  |

## Reflectors (for polarized retro-reflective)

Package Quantity: 1

| Item                       | Part No.<br>(Ordering No.)          |
|----------------------------|-------------------------------------|
| Reflector                  | Standard IAC-R5                     |
|                            | Small IAC-R6                        |
|                            | Large IAC-R8                        |
|                            | Narrow (rear/side mounting) IAC-R7M |
|                            | Narrow (rear mounting) IAC-R7B      |
|                            | Narrow (side mounting) IAC-R7S      |
|                            | Tape Type (40 × 35mm) IAC-RS1       |
|                            | Tape Type (80 × 70mm) IAC-RS2       |
| Reflector Mounting Bracket | For IAC-R5 IAC-L2                   |
|                            | For IAC-R6 IAC-L3                   |
|                            | For IAC-R8 IAC-L5                   |

\* See P25 for dimensions.

- IAC-L2 is not supplied with mounting screws and nuts. Use commercially available M4 screws and nuts for mounting the IAC-R5 reflector.
- IAC-L3 is supplied with two mounting screws (M3 × 8mm sems screws).
- IAC-L5 is supplied with two mounting screws (M4 × 10mm sems screws).
- IAC-R7M and IAC-R7S are supplied with two M3 × 8mm self-tapping screws, two flat washers, and two spring washers. IAC-R7B is supplied with an M3 × 8mm self-tapping screw, a flat washer, and a spring washer.

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

Package Quantity: 1

| Item                       | Part No.<br>(Ordering No.) |
|----------------------------|----------------------------|
| Reflector                  | Standard IAC-R9            |
|                            | Small IAC-R10              |
|                            | Ultra-small IAC-R11        |
| Reflector Mounting Bracket | For IAC-R9 IAC-L3          |

## Mounting Brackets

Package Quantity: 1

| Item                       | Part No.<br>(Ordering No.)   |
|----------------------------|------------------------------|
| Main Unit Mounting Bracket | Vertical Mounting SA9Z-K01   |
|                            | Horizontal Mounting SA9Z-K02 |
|                            | Cover type SA9Z-K03          |
|                            | Back Mounting SA9Z-K04       |

- Two mounting screws (M3 × 12mm sems screws) are supplied with the SA9Z-K01 and SA9Z-K02. Two mounting screws (M3 × 14mm sems screws) are supplied with the SA9Z-K03.
- The through-beam model requires two mounting brackets, one each for the projector and the receiver.
- SA9Z-K02 cannot be used for the connector types.
- Contact IDEC for mounting brackets for the connector.

## Connector Cable (for M8 connector type)

Package Quantity: 1

| Number of Core Wires | Style & Length  | Part No.<br>(Ordering No.) |
|----------------------|-----------------|----------------------------|
| 4                    | Straight, 2m    | SA9Z-CM8K-4S2              |
|                      | Straight, 5m    | SA9Z-CM8K-4S5              |
|                      | Right angle, 2m | SA9Z-CM8K-4L2              |
|                      | Right angle, 5m | SA9Z-CM8K-4L5              |

## Air Blower Mounting Block

Package Quantity: 1

| Item                      | Part No.<br>(Ordering No.) |
|---------------------------|----------------------------|
| Air Blower Mounting Block | SA9Z-A02                   |

- 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

## Sensitivity Control Screwdriver

Package Quantity: 1

| Item                                                                                                                    | Part No.<br>(Ordering No.) |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Sensitivity Control Screwdriver<br> | SA9Z-AD01                  |

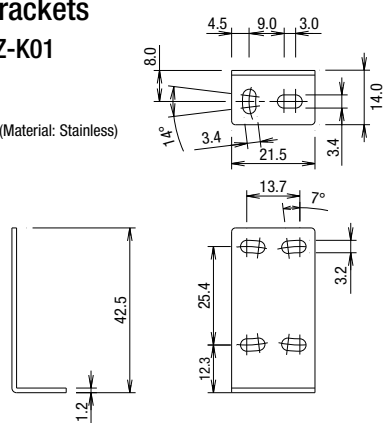
### Accessory Dimensions (SA2E/SA1E) (optional)

All dimensions in mm

## Mounting Brackets

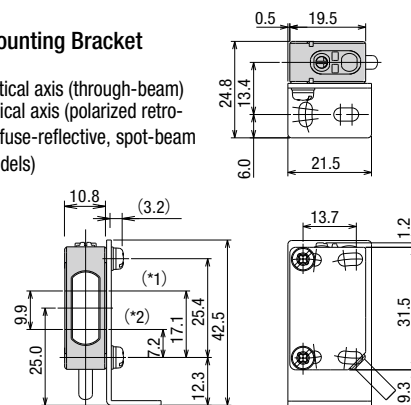
SA9Z-K01

(Material: Stainless)



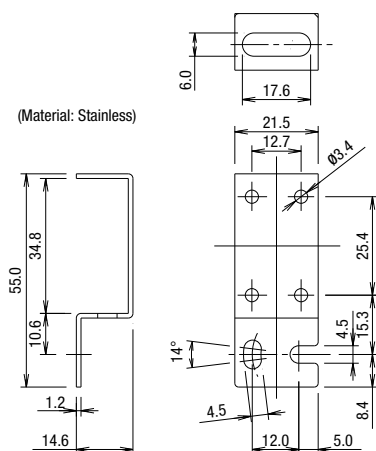
### With Mounting Bracket

- \*1: Center of optical axis (through-beam)  
\*2: Center of optical axis (polarized retro-reflective, diffuse-reflective, spot-beam reflective models)



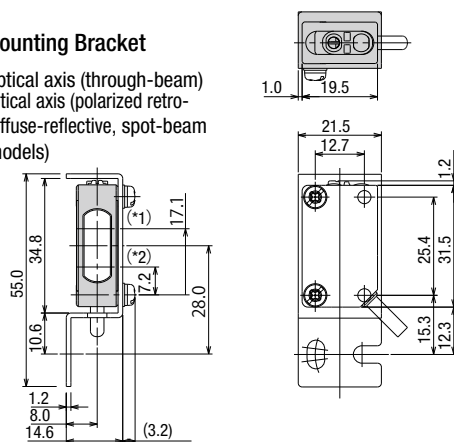
## SA9Z-K02

(Material: Stainless)



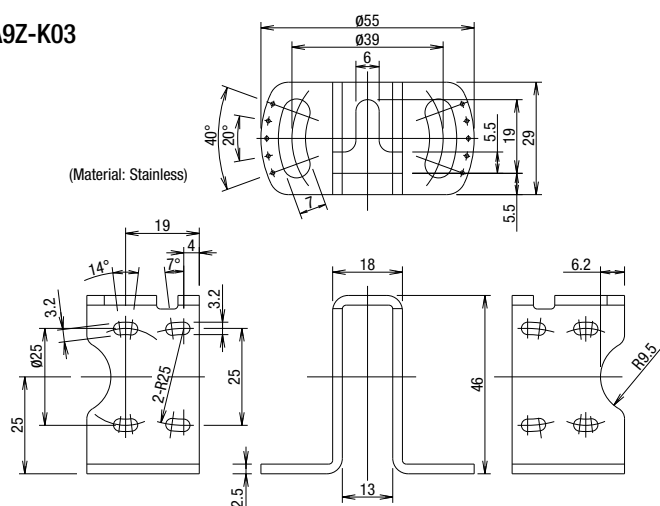
### With Mounting Bracket

- \*1: Center of optical axis (through-beam)  
\*2: Center of optical axis (polarized retro-reflective, diffuse-reflective, spot-beam reflective models)

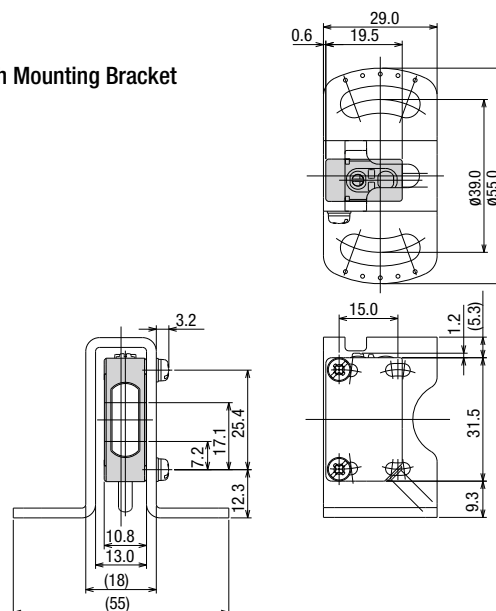


## SA9Z-K03

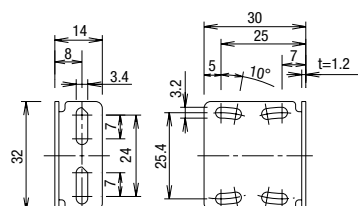
(Material: Stainless)



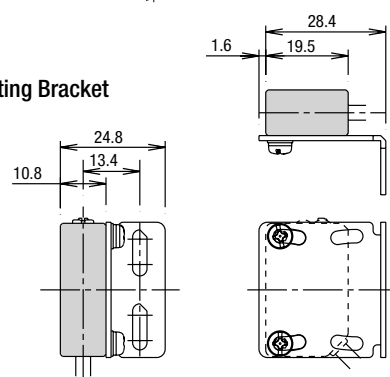
### With Mounting Bracket



## SA9Z-K04



### With Mounting Bracket

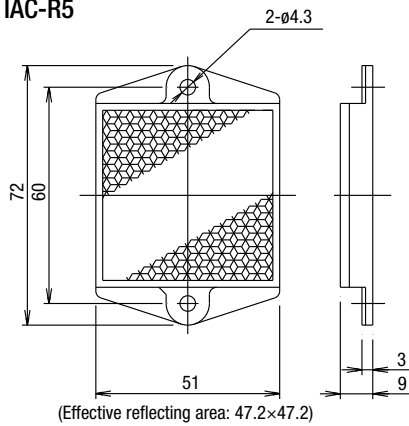


# Accessory Dimensions (SA2E/SA1E) (optional)

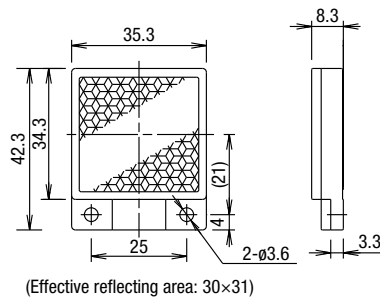
All dimensions in mm

## Reflectors

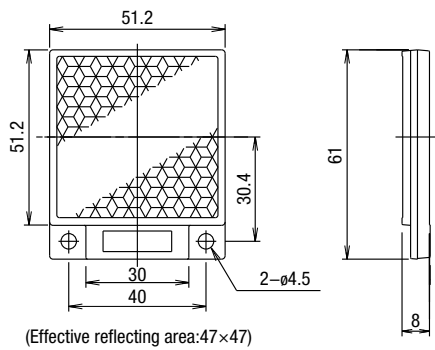
IAC-R5



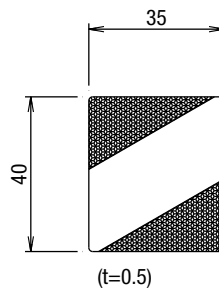
IAC-R6



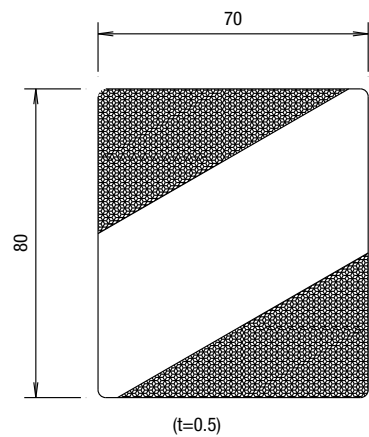
IAC-R8



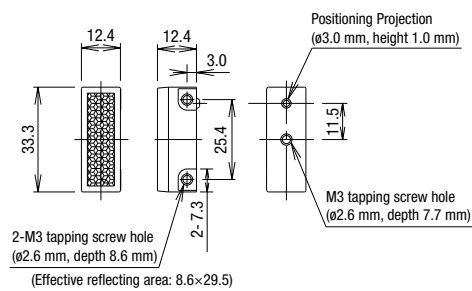
IAC-RS1



IAC-RS2

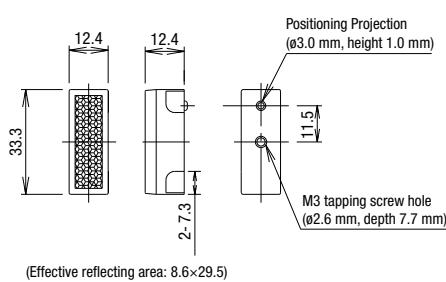


IAC-R7M (rear/side mounting)



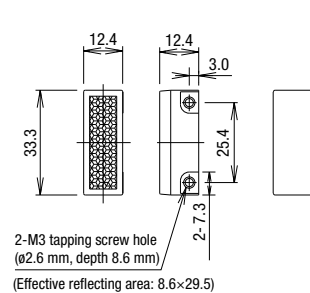
Note: The mounting plate for reflector must be 0.8 to 2.5mm in thickness.

IAC-R7B (rear mounting)



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

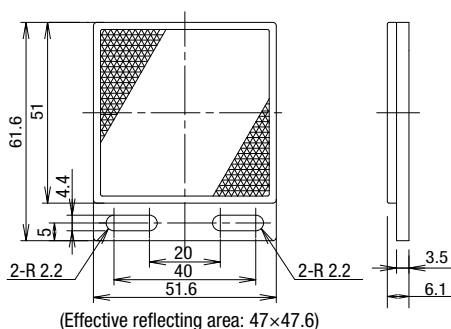
IAC-R7S (side mounting)



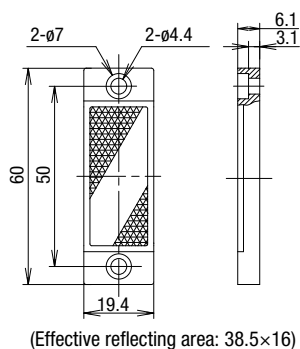
Note: The mounting plate for reflector must be 0.8 to 2.5mm in thickness.

IAC-R9

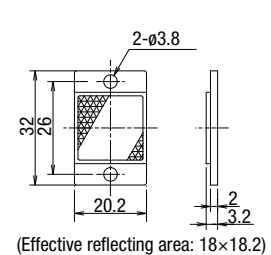
Reflector for SA1E-X (Coaxial Polarized Retro-reflective)



IAC-R10



IAC-R11

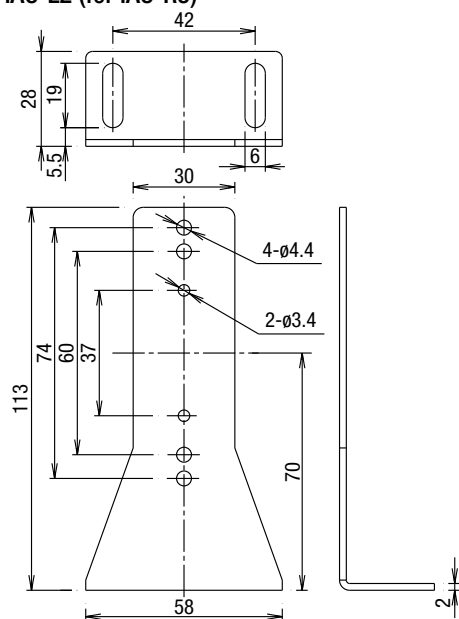


# Accessory Dimensions (SA2E/SA1E) (optional)

All dimensions in mm.

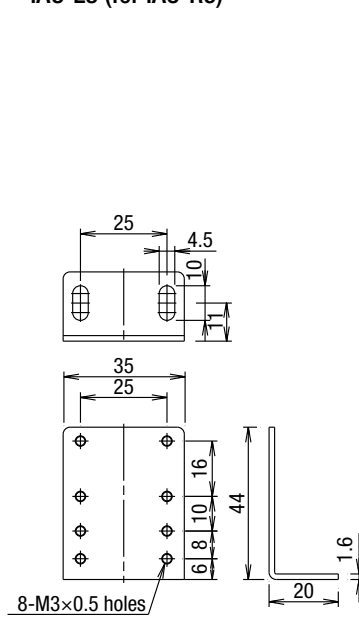
## Reflector Mounting Brackets

### IAC-L2 (for IAC-R5)



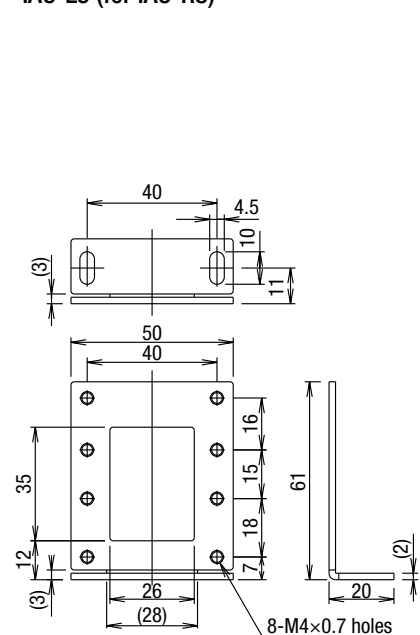
Material: SPCC

### IAC-L3 (for IAC-R6)



Material: SPCC

### IAC-L5 (for IAC-R8)

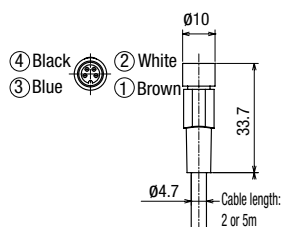


Material: SPCC

## Connector Cable (connector on one end)

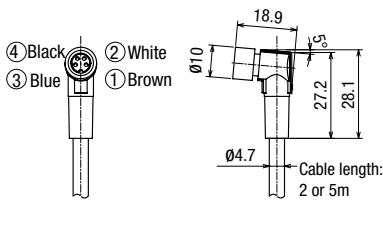
### Straight

#### SA9Z-CM8K-4S□



### Right-angle

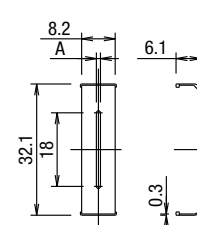
#### SA9Z-CM8K-4L□



## Slit Dimensions

### Vertical Slit

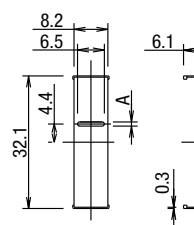
#### SA9Z-S06 SA9Z-S07 SA9Z-S08



Material: Stainless Steel

### Horizontal Slit

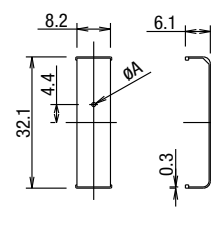
#### SA9Z-S09 SA9Z-S10 SA9Z-S11



Material: Stainless Steel

### Round Slit

#### SA9Z-S12 SA9Z-S13 SA9Z-S14



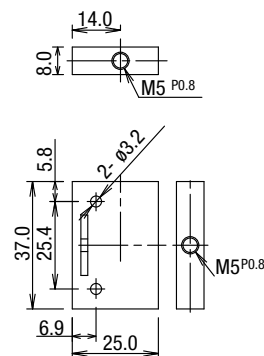
Material: Stainless Steel

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

Note: For slit width A, see P13.

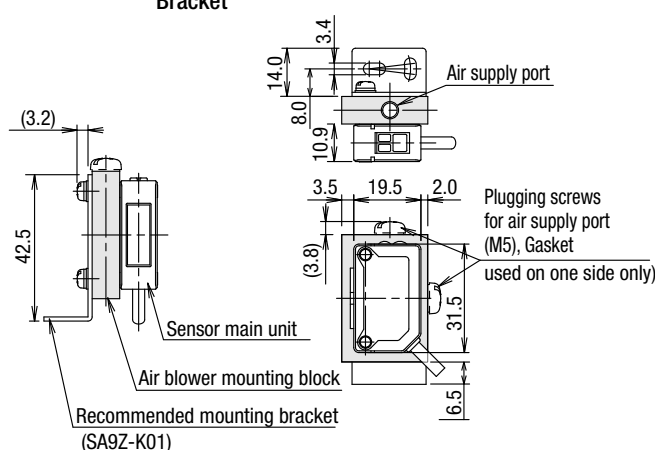
## Air Blower Mounting Block

### SA9Z-A02



Air Blower Mounting Block

### With Mounting Bracket



•The SA9Z-A02 air blower mounting block is supplied with two mounting screws (M3 × 20mm semi screws), one screw for plugging the air supply port (M5 × 6 mm), and one gasket for plugging the air supply port (1mm thick).

•An air tube fitting (M5) can be installed to either the top or side. Tighten the fitting to a torque of 0.5 N·m maximum.

•The air tube fitting and mounting bracket are not supplied and must be ordered separately. (Recommended mounting bracket: SA9Z-K01)

Material: Anodized aluminum surface