IDEC

Think Automation and beyond...

IDEC SA1E Photoelectric Sensors

Spec Tech Industrial 203 Vest Ave. Valley Park, MO 63088   Phone: 888 SPECTECH
Email: sales@spectechind.com   www.spectechind.com

SA1E Sensors

Photoelectric sensors

Photoelectric sensors send a beam of light to detect the presence of target objects, generally utilizing an emitter and receiver for this function. Photoelectric technology is ideal for industries such as material handling, packaging, electronics and semiconductor manufacturing, food and beverage and pharmaceutical.

IDEC SA1E photoelectric sensors

Accurate detection of target objects is imperative for control systems. With reliable object detection and repeatability, you can have fewer false alarms and less product rejection. Designed to function consistently over time and tolerate harsh industrial environments, the IDEC SA1E photoelectric sensors are completely assembled using precise robotic technology to produce a reliable, accurate and durable product. No matter how demanding your application is, there's an SA1E photoelectric sensor with the features to suit your requirements and a low price to fit your budget!

SA1E photoelectric sensors come in an easy-to-install, compact housing with a choice of NPN or PNP outputs, as well as a choice of operation modes. In Light ON mode, the output is energized when the sensor detects light. In Dark ON mode, the output is energized when the sensor detects dark (the absence of light).

Highlights:

- Fully automated assembly
- High speed response
- Subminiature design
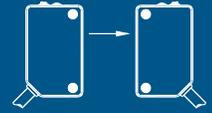- Cable and M8 Quick connector models available
- IP67 rated

Available Models:

- **Through-beam**
- **Polarized retro-reflective**
- **Background suppression (fixed field)**
- **Convergent (point focus)**
- **Diffuse-reflective**
- **Small-beam reflective**

10.8mm wide
31.5mm high
19.5mm deep

Through-beam models

Benefits of through-beam sensors:

- Suitable for dirty environments
- Offers precise detection
- Detects target objects up to 10 meters away

IDEC SA1E through-beam photoelectric sensors are configured with the emitter and detector placed facing each other, perpendicular to the path of the target object. Light is sent from the emitter to the receiver, and the target object is detected when the beam is broken.
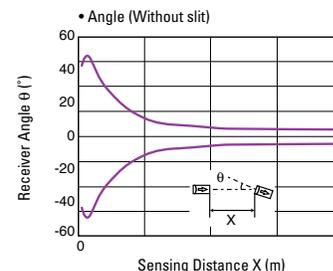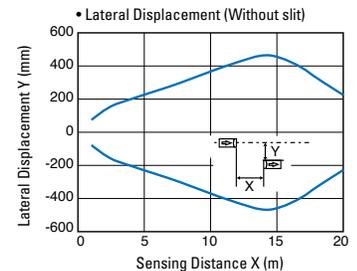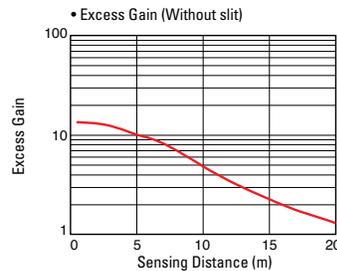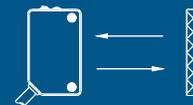
Through-beam
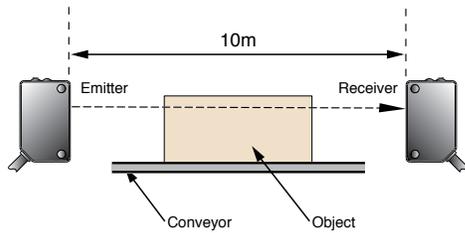
10m

Emitter   Receiver

Conveyor   Object

Sensing Method	Sensing Range	Connection	Cable Length	Operation Mode	Part Number	
					NPN Output	PNP Output
Through-Beam Infrared LED	10m*	Cable	2m	Light ON	SA1E-TN1-2M	SA1E-TP1-2M
				Dark ON	SA1E-TN2-2M	SA1E-TP2-2M
		M8 Connector	2m or 5m (Order Separately)	Light ON	SA1E-TN1C	SA1E-TP1C
				Dark ON	SA1E-TN2C	SA1E-TP2C

*Without Sensitivity Adjustment: 1. SA1E-TN2-NA-2M, 2. SA1E-TP2-NA-2M (15 meter range)

• Excess Gain (Without slit)

Excess Gain

Sensing Distance (m)

• Lateral Displacement (Without slit)

Lateral Displacement Y (mm)

Sensing Distance X (m)

• Angle (Without slit)

Receiver Angle θ (°)

Sensing Distance X (m)
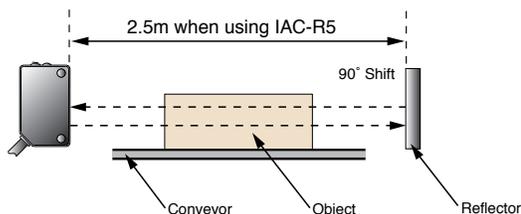
Polarized retro-reflective models

Benefits of polarized retro-reflective sensors:
• Emitter and detector in one unit
• Polarized beam detects matte and mirrored objects
• Detects reflective objects

IDEC SA1E polarized retro-reflective sensors are configured with the emitter and detector housed in one unit. Light is sent from the sensor's emitter to a reflector, which then reflects the light back to the sensor's receiver. The biggest advantage of using this type of sensor is that wiring is very easy due to the fact you only have one unit to wire. These sensors are also ideal for detecting mirror-like objects.
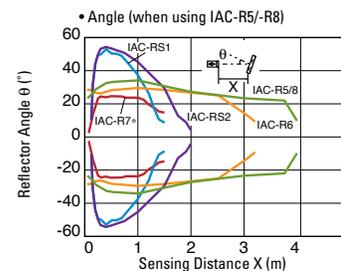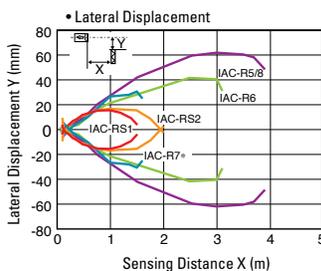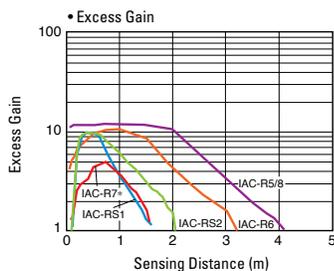
Polarized retro-reflective

2.5m when using IAC-R5

90° Shift

Conveyor   Object   Reflector

Sensing Method	Sensing Range	Connection	Cable Length	Operation Mode	Part Number	
					NPN Output	PNP Output
Polarized Retro-reflective Red LED	2.5m when using IAC-R5 2.5m when using IAC-R8 1.5m when using IAC-R6 1.0m when using IAC-RS1 1.3m when using IAC-RS2 0.8m when using IAC-R7	Cable	2m	Light ON	SA1E-PN1-2M	SA1E-PP1-2M
				Dark ON	SA1E-PN2-2M[1]	SA1E-PP2-2M[2]
		M8 Connector	2m or 5m (Order Separately)	Light ON	SA1E-PN1C	SA1E-PP1C
				Dark ON	SA1E-PN2C	SA1E-PP2C

Without Sensitivity Adjustment: 1. SA1E-PN2-NA-2M, 2. SA1E-PP2-NA-2M

• Excess Gain

Excess Gain

IAC-R7*
IAC-RS1
IAC-RS2   IAC-R6
IAC-R5/8

Sensing Distance (m)

• Lateral Displacement

Lateral Displacement Y (mm)

IAC-RS1*
IAC-RS2
IAC-R7*
IAC-R5/8
IAC-R6

Sensing Distance X (m)

• Angle (when using IAC-R5/-R8)

Reflector Angle θ (°)

IAC-RS1
IAC-R7*
IAC-RS2
IAC-R5/8
IAC-R6

Sensing Distance X (m)
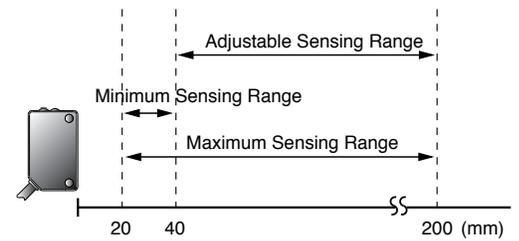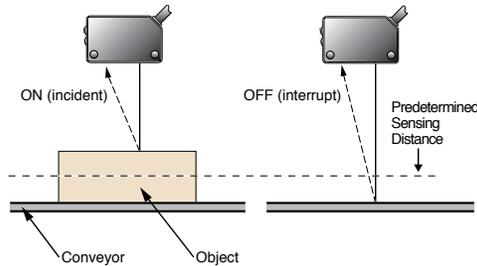
Background suppression models

Benefits of background suppression (fixed field) sensors:

- Reliable object recognition
- Fewer false alarms and product rejections
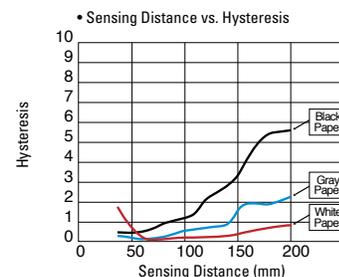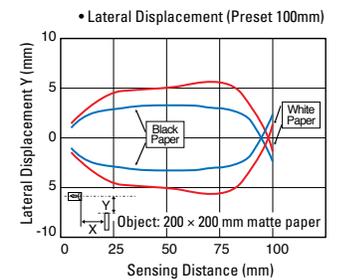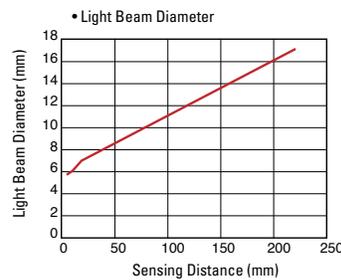- Higher level of precision and repeatability

IDEC SA1E background suppression sensors determine the presence of target objects based on a predetermined sensing distance. This means objects beyond the cut-off range won't be detected, and ensures that target objects can be accurately and reliably detected regardless of color or reflectivity.
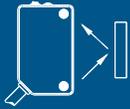
Background suppression

ON (incident)   OFF (interrupt)   Predetermined Sensing Distance

Conveyor   Object

Adjustable Sensing Range

Minimum Sensing Range

Maximum Sensing Range

20   40   200 (mm)

Sensing Method	Sensing Range	Connection	Cable Length	Operation Mode	Part Number	
					NPN Output	PNP Output
Background suppression Red LED w/Sensing Range Adjustment	20 to 200mm (Adjustable Sensing Range 40 to 200mm)	Cable	2m	Light ON	SA1E-BN1-2M	SA1E-BP1-2M
				Dark ON	SA1E-BN2-2M	SA1E-BP2-2M
		M8 Connector	2m or 5m (Order Separately)	Light ON	SA1E-BN1C	SA1E-BP1C
				Dark ON	SA1E-BN2C	SA1E-BP2C

• Light Beam Diameter

Light Beam Diameter (mm)

Sensing Distance (mm)

• Lateral Displacement (Preset 100mm)

Lateral Displacement Y (mm)

White Paper

Black Paper

Object: 200 × 200 mm matte paper

Sensing Distance (mm)

• Sensing Distance vs. Hysteresis

Hysteresis

Black Paper

Gray Paper

White Paper

Sensing Distance (mm)

Convergent models

Benefits of convergent (point focus) sensors:

• Ideal for objects with low reflectivity and varying colors
• Reliable detection of objects with a small profile
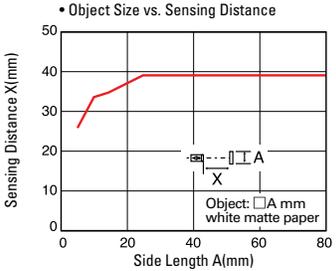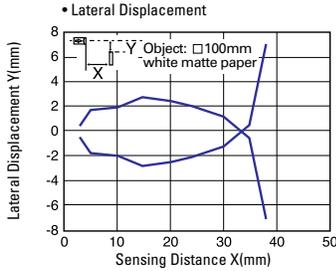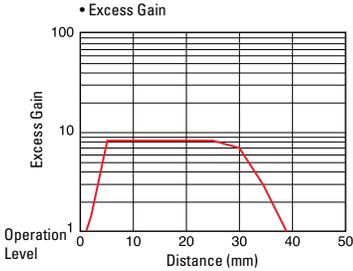• Accurate short distance sensing, while ignoring the background

IDEC SA1E convergent sensors focus the emitter and receiver to an exact point in front of the sensor. This method of sensing provides an intense and well-defined sensing area. This allows for detection of transparent objects.
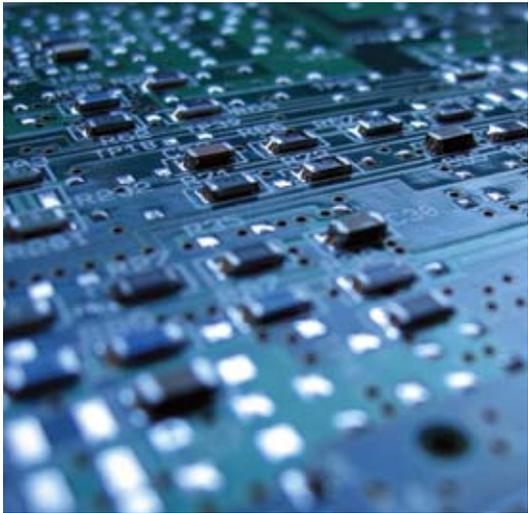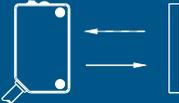
Convergent
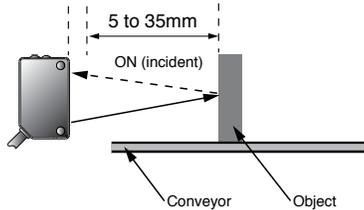
5 to 35mm
ON (incident)
Conveyor   Object

Sensing Method	Sensing Range	Connection	Cable Length	Operation Mode	Part Number	
					NPN Output	**PNP Output**
Convergent Infrared LED	5 to 35mm	Cable	2m	Light ON	SA1E-GN1-2M	SA1E-GP1-2M
				Dark ON	SA1E-GN2-2M	SA1E-GP2-2M
		Connector	2m or 5m (Order Separately)	Light ON	SA1E-GN1C	SA1E-GP1C
				Dark ON	SA1E-GN2C	SA1E-GP2C

• Excess Gain

Excess Gain
Operation Level
Distance (mm)

• Lateral Displacement

Lateral Displacement Y(mm)
Y Object: □100mm white matte paper
X
Sensing Distance X(mm)

• Object Size vs. Sensing Distance

Sensing Distance X(mm)
A
X
Object: □A mm white matte paper
Side Length A(mm)

Diffuse-reflective models

## Benefits of diffuse-reflective sensors:

• Emitter and detector in one unit
• Easy alignment and a 700mm maximum sensing range
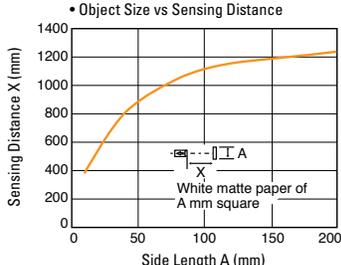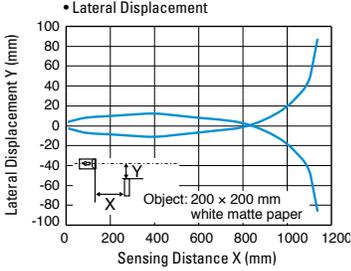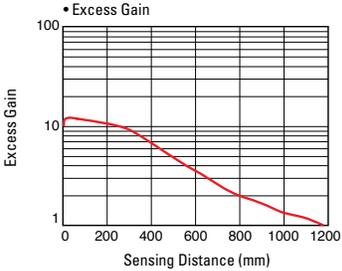• Detects transparent or translucent objects

IDEC SA1E diffuse-reflective sensors have the emitter and receiver built into a single unit that allows these sensors to rely upon reflection from the surface of the target object. Light is sent from the sensor's emitter to the target objects and bounced back to the sensor's receiver. Diffuse sensing is the premiere choice for materials that are translucent to light. These sensors are also ideal for many types of applications because they are easy to setup and use. You only need to wire one unit and there is no need for a separate receiver or reflector.
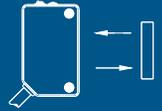
Diffuse-reflective
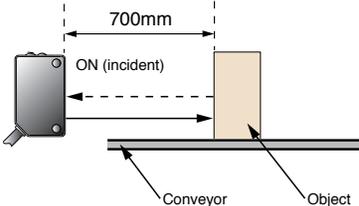
700mm

ON (incident)

Conveyor   Object

Sensing Method	Sensing Range	Connection	Cable Length	Operation Mode	Part Number	
					NPN Output	PNP Output
Diffuse-reflective Infrared LED	700mm	Cable	2m	Light ON	SA1E-DN1-2M	SA1E-DP1-2M
				Dark ON	SA1E-DN2-2M	SA1E-DP2-2M
		M8 Connector	2m or 5m (Order Separately)	Light ON	SA1E-DN1C	SA1E-DP1C
				Dark ON	SA1E-DN2C	SA1E-DP2C

• Excess Gain

Excess Gain
Sensing Distance (mm)

• Lateral Displacement

Lateral Displacement Y (mm)
Object: 200 × 200 mm white matte paper
Sensing Distance X (mm)

• Object Size vs Sensing Distance

Sensing Distance X (mm)
White matte paper of A mm square
Side Length A (mm)
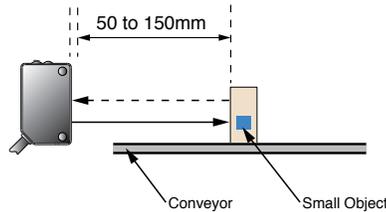
Small-beam reflective models

Benefits of small-beam reflective sensors:

• Emitter and detector in one unit
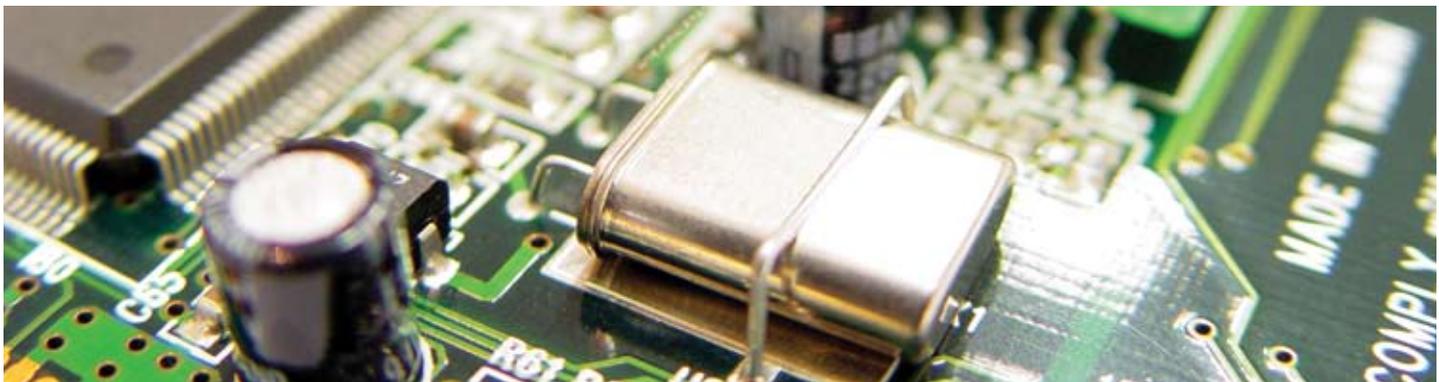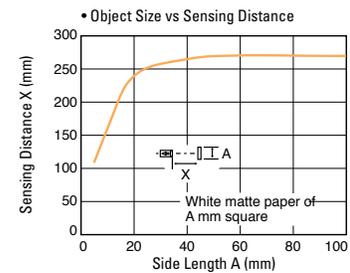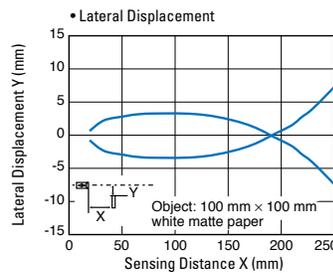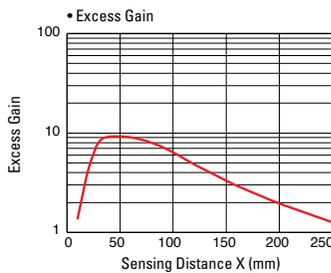• Narrow beam ignores object around target
• Detects small objects

IDEC SA1E small-beam reflective sensors operate like diffuse-reflective, the emitter and receiver are contained in the same housing. However, the small light beam generated by these sensors can reach a target in a narrow space at a distance up to 150mm. This makes them an ideal sensor for detecting very small objects, within a narrow field of vision.

Small-beam reflective

50 to 150mm

Conveyor   Small Object

Sensing Method	Sensing Range	Connection	Cable Length	Operation Mode	Part Number	
					NPN Output	PNP Output
Small-Beam Reflective Red LED	50 to 150mm	Cable	2m	Light ON	SA1E-NN1-2M	SA1E-NP1-2M
				Dark ON	SA1E-NN2-2M	SA1E-NP2-2M
		M8 Connector	2m or 5m (Order Separately)	Light ON	SA1E-NN1C	SA1E-NP1C
				Dark ON	SA1E-NN2C	SA1E-NP2C

• Excess Gain

Excess Gain / Sensing Distance X (mm)

• Lateral Displacement

Lateral Displacement Y (mm) / Sensing Distance X (mm)
Object: 100 mm × 100 mm white matte paper

• Object Size vs Sensing Distance

Sensing Distance X (mm) / Side Length A (mm)
White matte paper of A mm square

Accessories

SA9Z-S07

Slits (for through-beam sensors)

Item	Slit Size	Part No.	Min. Order Quantity
Vertical Slit	0.5mm x 18mm	SA9Z-S06	
	1.0mm x 18mm	SA9Z-S07	
	2.0mm x 18mm	SA9Z-S08	
Horizontal Slit	0.5mm x 6.5mm	SA9Z-S09	2
	1.0mm x 6.5mm	SA9Z-S10	
	2.0mm x 6.5mm	SA9Z-S11	
Round Slit	ø0.5mm	SA9Z-S12	
	ø1.0mm	SA9Z-S13	
	ø2.0mm	SA9Z-S14	

SA9Z-K01

SA9Z-K02

Mounting Brackets

Item		Part No.
Mounting Bracket	Vertical Mounting	SA9Z-K01
	Horizontal Mounting	SA9Z-K02
	Cover type	SA9Z-K03

- Two mounting screws (M3 X 12mm sems screws) are supplied with the SA9Z-K01 and SA9Z-K02.
- Two mounting screws (M3 X 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.
- The SA9Z-K02 cannot be used with the connector model.

SA9Z-A02

Air Blower Mounting Blocks

Item	Part No.
Air Blower Mounting Block	SA9Z–A02

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

IAC-RS1

IAC-R5

IAC-R6

IAC-L2

Reflectors (for polarized retro-reflective sensors)

Item		Part 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 (35 x 40mm)	IAC-RS1
	Tape (70 x 80mm)	IAC-RS2
Reflector Mounting Bracket	For IAC-R5	IAC-L2
	For IAC-R6	IAC-L3
	For IAC-R8	IAC-L5

- 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 x 8mm sems screws).
- IAC-L5 is supplied with two mounting screws (M4 x 10mm sems screws).
- IAC-R7M and IAC-R7S are supplied with two M3 x 8mm self-tapping screws, two flat washers, and two spring washers.
- IAC-R7B is supplied with one M3 x 8mm self-tapping screw, a flat washer, and a spring washer.

SA9Z-CM8K-4S2

SA9Z-CM8K-4L2

Connector Cable (for connector-model sensors)

Number of Core Wires	Type & Length	Part No.
4	Straight, 2m	SA9Z-CM8K-4S2
	Straight, 5m	SA9Z-CM8K-4S5
	Right angle, 2m	SA9Z-CM8K-4L2
	Right angle, 5m	SA9Z-CM8K-4L5

Sensing Method	Through-beam	Polarized Retro-reflective	Diffuse-reflective	Small-beam Reflective	Background Suppression	Convergent
Part No.	SA1E-T	SA1E-P	SA1E-D	SA1E-N	SA1E-B	SA1E-G
Power Voltage	12 to 24V DC (Operating range: 10 to 30V DC) Equipped with reverse-polarity protection					
Power Consumption	Projector: 15mA Receiver: 20mA	30mA				
Sensing Range	10m (with sensitivity adjustment) 15m (without sensitivity adjustment)	2.5m (IAC-R5/R8) 1.5m (IAC-R6) (Note 1) 1.0m (IAC-RS1) 0.8m (IAC-R7)	700mm (using 200 x 200mm white matte paper)	50 to 150mm (using 100 x 100mm white matte paper)	20mm to 200mm (Using 200 x 200mm white matte paper)	5 to 35mm (Using 100 x 100mm white matte paper)
Detectable Object	Opaque		Opaque/Transparent		Opaque	Opaque/Transparent
Hysteresis	—		20% maximum		10% maximum	20% maximum
Response Time	1ms maximum					
Sensitivity Adjustment	Adjustable using a potentiometer (approx. 260°)				6-turn control knob	Adjustable using a potentiometer (approx. 260°)`
	Through-beam and polarized retro-reflective type are also available without sensitivity adjustment.		—			
Light Source Element	Infrared LED	Red LED	Infrared LED	Red LED	Red LED	Infrared LED
Operation Mode	Light ON/Dark ON					
Control Output	NPN open collector or PNP open collector 30V DC, 100mA maximum Voltage drop: 1.2V maximum (BGS model = 2V maximum) Short-circuit protection					
LED Indicators	Operation LED: Yellow Stable LED: Green Power LED: Green (Through-beam model projector)				Operation LED: Yellow Stable LED not provided	Operation LED: Yellow Stable LED: Green
Interference Prevention	—	Two units can be mounted closely.				
Degree of Protection	IP67 (IEC60529)					
Extraneous Light Immunity	Sunlight: 10,000 lux maximum, Incandescent lamp: 5,000 lux maximum (at receiver)					
Operating Temperature	−25 to +55°C (no freezing)					
Operating Humidity	35 to 85% 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	Between live part and mounting bracket: 1,000V AC, 50/60 Hz, 1 minute					
Vibration Resistance	Damage limits: 10 to 55 Hz, Amplitude 0.75mm, 20 cycles in each of 3 axes					
Shock Resistance	Damage limits: 500 m/s^2 (50G), 10 shocks in each of 3 axes					
Material	Housing: PC/PBT, Lens: PC (Polarized retro-reflective model: PMMA), Indicator cover: PC					
Attachments	Instruction sheet, Sensitivity control screwdriver					
Weight (approx.) Cable	Projector: 50g (Note 2) Receiver: 50g (Note 2)	50g			55g	50g
Weight (approx.) Connector	Projector: 10g Receiver: 10g	10g			20g	10g
Connection Method Cable	ø3.5mm, 3-core, 0.2mm^2, 2-m vinyl cabtyre cable (2-core for the projector of through-beam type)					
Connection Method Connector	M8 connector (4-pin)					

Note 1: Maintain at least 100mm between the SA1E photoelectric switch and reflector. Note 2: Cable length: 2m (110g when the cable length is 5m)
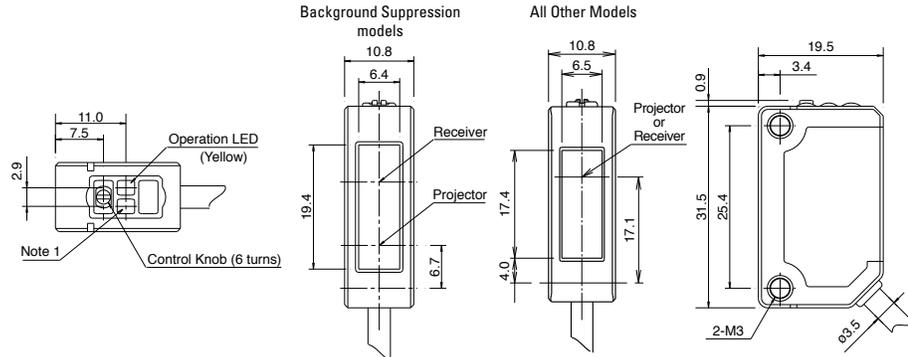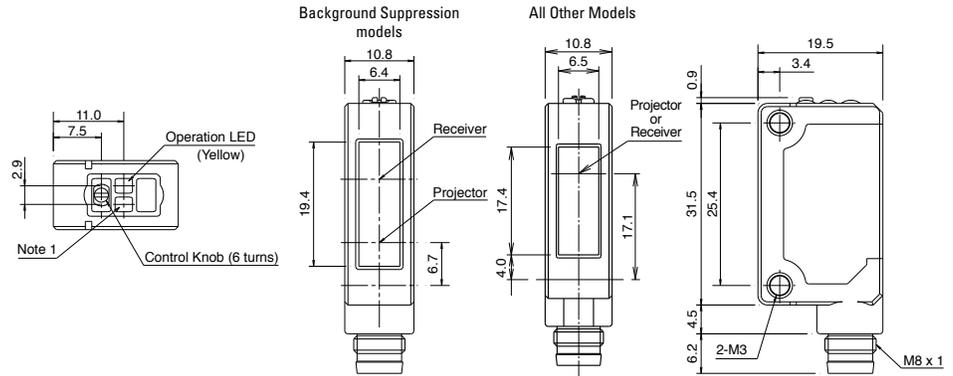
SA1E

Precision sensors at a great low price

Dimensions

Sensors
(All dimensions in mm)

Cable Model

Operation LED (Yellow)
Note 1
Control Knob (6 turns)

Background Suppression models
Receiver
Projector

All Other Models
Projector or Receiver

2-M3
ø3.5

Connector Model

Operation LED (Yellow)
Note 1
Control Knob (6 turns)

Background Suppression models
Receiver
Projector

All Other Models
Projector or Receiver

2-M3
M8 x 1

Note1: Stable LED is not provided on the background suppression models.

Mounting Brackets

SA9Z-K01
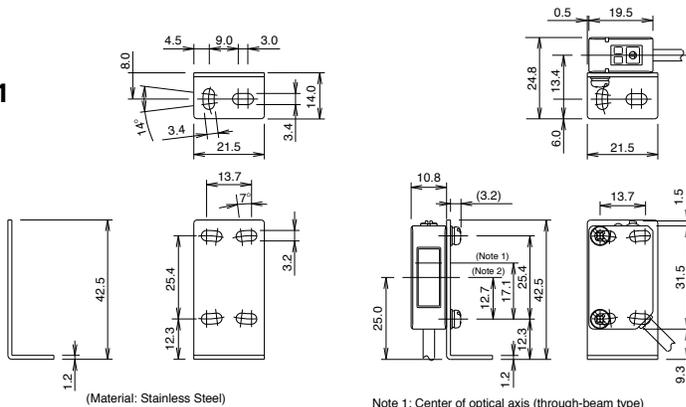
(Material: Stainless Steel)

Note 1: Center of optical axis (through-beam type)
Note 2: Center of optical axis (polarized retroreflective, diffuse reflective, and small-beam reflective type)

SA9Z-K02

(Material: Stainless Steel)

Note 1: Center of optical axis (through-beam type)
Note 2: Center of optical axis (polarized retroreflective, diffuse reflective, and small-beam reflective type)

IAC-L2

4-ø4.4
2-ø3.4
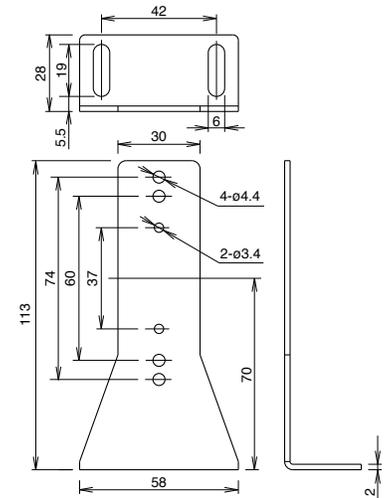
Material: SPCC (zinc chromate plating, black)
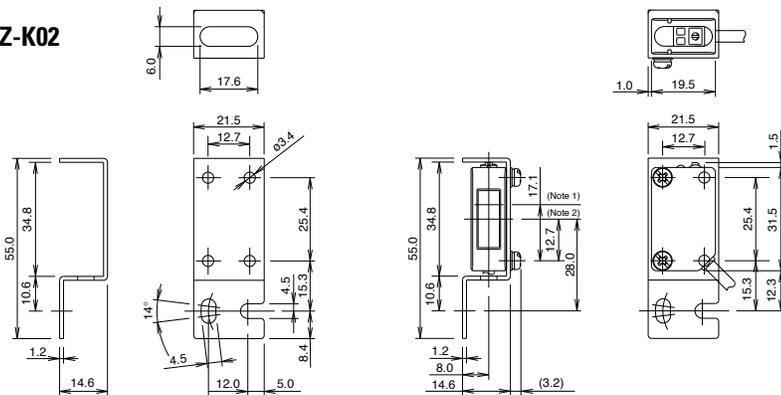
IAC-L3

8-M3 × 0.5 holes
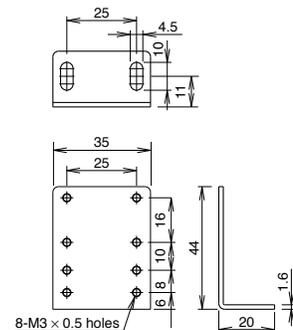
Material: SPCC (zinc plating)

11

The best PLCs for your money

IDEC controllers offer speed, power, performance and precision, as well as being easy to use, and easy to maintain. Just a simple, ready-made solution that won't require time you don't have to give. Instead, save time with a reliable product that gives you faster response, better throughput, and less downtime. For more information, visit www.idec.com/plc.

Get the power you need

IDEC power supplies offer worldwide approvals, universal voltage inputs, fused inputs, auto-resetting overload protection and various styles. In fact, the new PS5R Slim Line models give you all the power of a traditional power supply in only half the space. Utilize them in tight places or save valuable DIN Rail space while still filling your requirements for power. For more information, visit www.idec.com/powersupply.

PLC Training

Want more MicroSmart and WindLDR experience? Get hands-on guidance from IDEC's expert technical staff. These intensive, three-day sessions cover PLC and touchscreen programming, setup, troubleshooting and more. Classes are held throughout the year at various locations in the US and Canada. For the latest schedule of upcoming classes, visit our web site at www.idec.com/usa/training.

Find your local IDEC Representative or Distributor

Visit www.idec.com/usa/locator or call 800-262-IDEC.

Product Support

Technical support:
support@idec.com

Sales support:
sales@idec.com

IDEC

Think Automation and beyond...