IDEC

Think Automation and beyond...

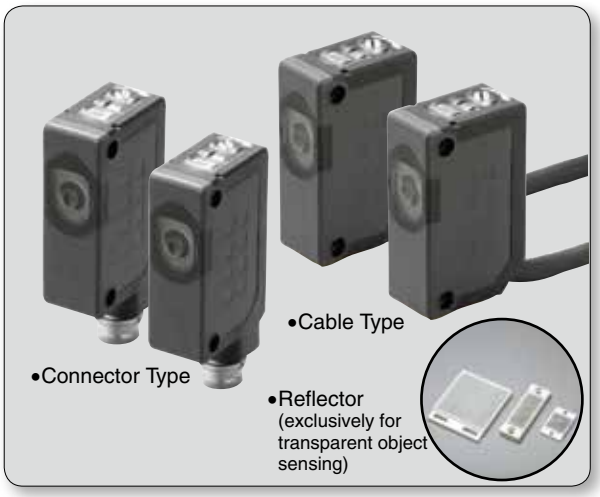
SA1E-X

Miniature Photoelectric Switches

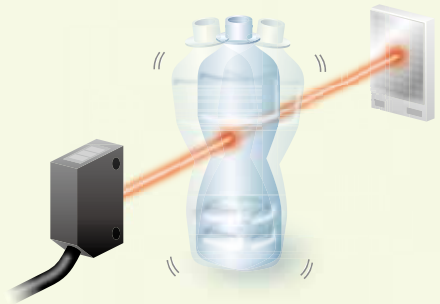
(Transparent Object Sensing)

Detects transparent objects, features a long sensing range up to 2m!

c UL us LISTED CE

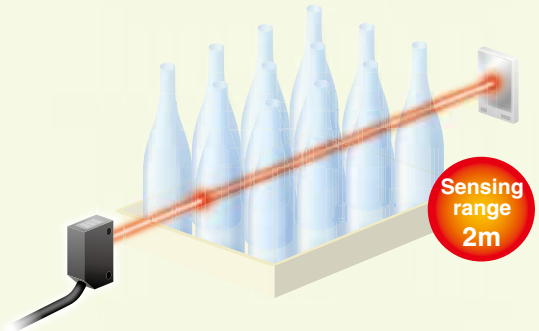


Not affected by irregular surfaces and angle of the target object



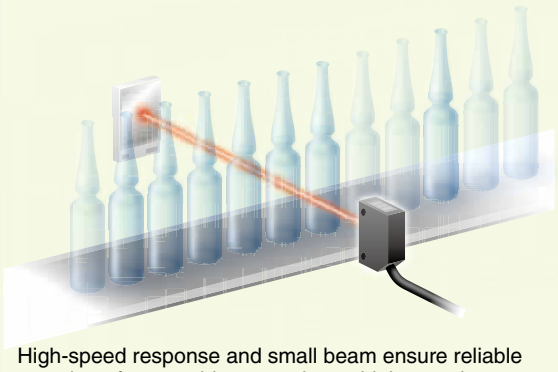
Coaxial optical structure and narrow beam ensure stable detection; unaffected by constriction, inclination or shaking of a bottle.

Sensing range: 2m max.



Long sensing range of up to 2m accommodates a wide range of objects from small pallets carrying glass or plastic bottles to large pallets.

Reliably counts objects close to each other



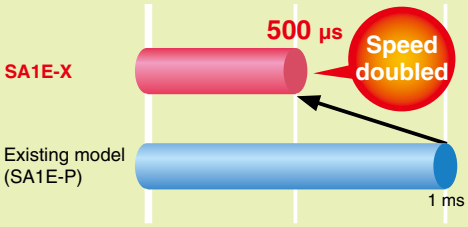
High-speed response and small beam ensure reliable counting of target objects moving at high speed.

IP67 construction provides resistance against water and dust

IP67 housing allows reliable use in wet locations.

Twice the response speed

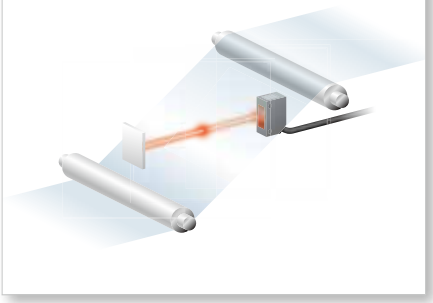
■Speed comparison with existing model



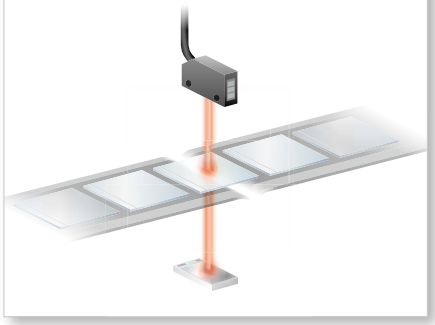
High response speed of 500 µs, twice that of IDEC's existing model, acheives stable detection when objects pass by quickly.

Application Examples

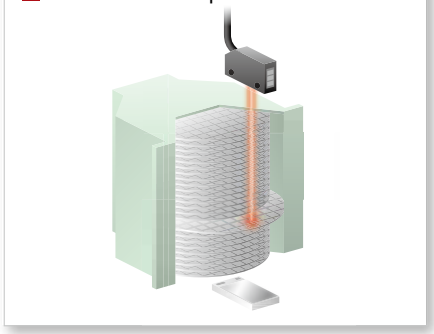
■ Detects ends of transparent film



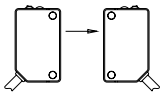
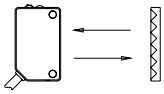
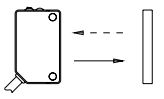
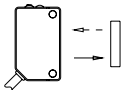
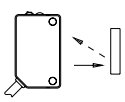
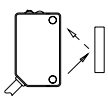
■ Detects transparent case packaging



■ Detects wafer displacement



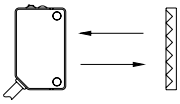
SA1E Miniature Photoelectric Switches (Built-in Amplifier)

Type No.	Sensing Method				Sensing Range	Connection	Cable Length (m)	Operation Mode
SA1E-T	Through-beam	Infrared LED	With Sensitivity Adjustment		10m	Cable	1, 2, 5	Light ON Dark ON
						Connector	—	
			Without Sensitivity Adjustment		15m	Cable	1, 2, 5	
						Connector	—	
		Red LED	With Sensitivity Adjustment		10m	Cable	1, 2, 5	
						Connector	—	
SA1E-P	Polarized Retro-reflective	Red LED	With Sensitivity Adjustment	 Note: Maintain at least the distance shown in [ ] between the photoelectric switch and reflector.	2.5m [100 mm] (when using IAC-R5/R8) 1.5m [100 mm] (when using IAC-R6) 1.3m [150 mm] (when using IAC-RS2) 1.0m [150 mm] (when using IAC-RS1) 0.8m [100 mm] (when using IAC-R7 □)	Cable	1, 2, 5	
						LED	—	
			Without Sensitivity Adjustment		3.0m [100 mm] (when using IAC-R5/R8) 2.0m [100 mm] (when using IAC-R6) 1.4m [150 mm] (when using IAC-RS2) 1.1m [150 mm] (when using IAC-RS1) 1.0m [100 mm] (when using IAC-R7 □)	Cable	1, 2, 5	
						Connector	—	
SA1E-D	Diffuse-reflective	Infrared LED	With Sensitivity Adjustment		700 mm	Cable	1, 2, 5	
						Connector	—	
SA1E-N	Small-beam Reflective	Red LED	With Sensitivity Adjustment		50 - 150 mm	Cable	1, 2, 5	
						Connector	—	
SA1E-B	Background Suppression (BGS)	Red LED	With Sensing Range Adjustment		20 to 200 mm Adjustable Sensing Range 40 to 200 mm	Cable	1, 2, 5	
						Connector	—	
SA1E-G	Convergent Reflective	Infrared LED	With Sensitivity Adjustment		5 to 35 mm	Cable	1, 2, 5	
						Connector	—	

For details, see catalog Cat. No. EP1155.

Types

Package Quantity: 1

Sensing Method	Sensing Range	Connection	Cable Length (m)	Operation Mode	Type No.	
					NPN Output	PNP Output
Coaxial Polarized Retro-reflective / Red LED / With Sensitivity Adjustment  Note: Reflector is not supplied and must be ordered separately. See characteristics diagrams on page 7.	2.0m (when using IAC-R9) 1.0m [100 mm] (when using IAC-R10) 1.0m [100 mm] (when using IAC-R11)	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

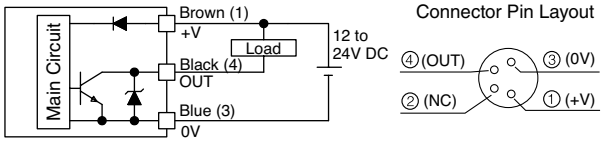
Specifications

		Coaxial Polarized Retro-reflective
Part Number		SA1E-X☐
Voltage		12 to 24V DC (Operating range: 10 to 30V DC; reverse-polarity protected)
Power Consumption		20 mA maximum
Sensing Range		2m (when using IAC-R9)
Detectable Object		Opaque, transparent and mirror-like objects
Response Time		500 µs maximum
Sensitivity Adjustment		Adjustable using a potentiometer (approx. 240°)
Light Source Element		Red LED
Operation Mode		Light ON/Dark ON
Control Output		NPN/PNP open collector (30V DC, 100 mA maximum; short-circuit protection) Voltage drop: 2V maximum
LED Indicators		Operation LED: Yellow
Interference Prevention		Two units can be mounted closely
Degree of Protection		IP67 (IEC60529)
Extraneous Light Immunity (at receiver)		Sunlight: 10,000 lux maximum, Incandescent lamp: 5,000 lux maximum
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 0.75 mm, 20 cycles in each of 3 axes
Shock Resistance		Damage limits: 500 m/s^2, 10 shocks in each of 3 axes
Material		Housing: PBT, Lens: PMMA, Indicator cover: PC
Attachments		Instruction Sheet
Weight (approx.)	Cable	35g (Note)
	Connector	20g
Connection Method	Cable	ø3.5 mm, 3-core, 0.2 mm^2, vinyl cabtyre cable
	Connector	M8 connector (4-pin)

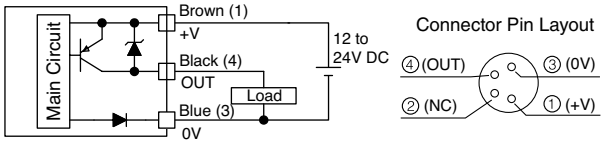
Note: Cable length: 1m (55g when the cable length is 2m and 120g when 5m)

Output Circuit/Wiring

• NPN Output Type



• PNP Output Type



Accessories (Optional)

• Reflectors (used only for transparent-object sensing)

Package Quantity: 1

Item		Type No.
Reflector	Standard	IAC-R9
	Small	IAC-R10
	Ultra-small	IAC-R11
Reflector Mounting Bracket	For IAC-R9	IAC-L3

• Sensor Mounting Brackets

Package Quantity: 1

Item		Type No.
Main Unit Mounting Brackets	Vertical Mounting	SA9Z-K01
	Horizontal Mounting	SA9Z-K02
	Cover type	SA9Z-K03
	Back Mounting	SA9Z-K04

• Sensitivity Control Screwdriver

Package Quantity: 1

Item	Type No.
Sensitivity Control Screwdriver	SA9Z-AD01

• Connector Cable (for connector type sensors)

Package Quantity: 1

Number of Core Wires	Type and Length	Type 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	Type No.
Air Blower Mounting Block	SA9Z-A02

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

• Slits

Package Quantity: 1 Set (2 pcs)

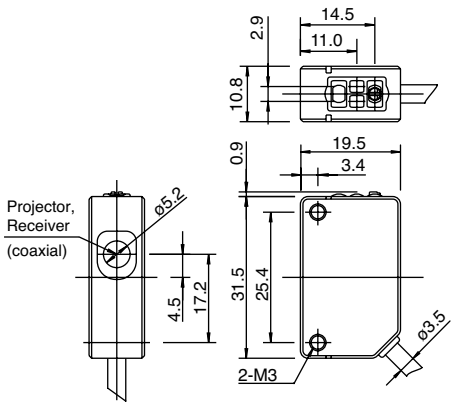
Item	Slit Size	Type No.
Vertical Slit	0.5 mm × 18 mm	SA9Z-S06PN02
	1.0 mm × 18 mm	SA9Z-S07PN02
	2.0 mm × 18 mm	SA9Z-S08PN02

Note: Horizontal or round slits cannot be used.

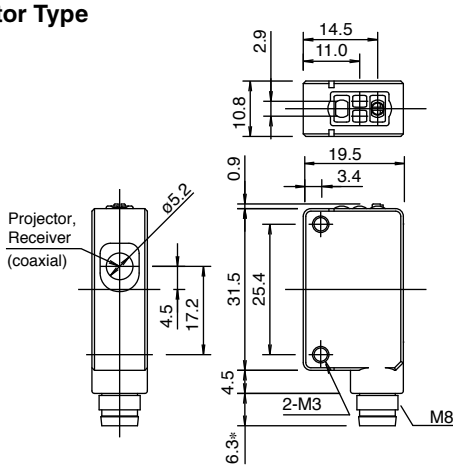
Dimensions

All dimensions in mm.

• Cable Type



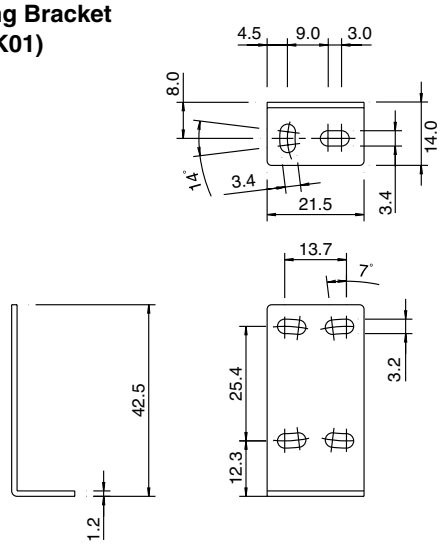
• Connector Type



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

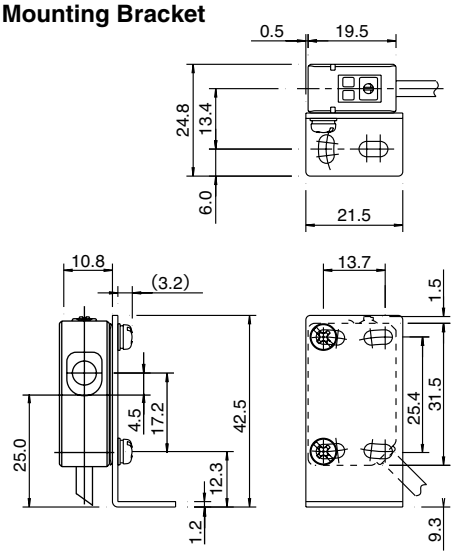
Accessory Dimensions

• Mounting Bracket (SA9Z-K01)

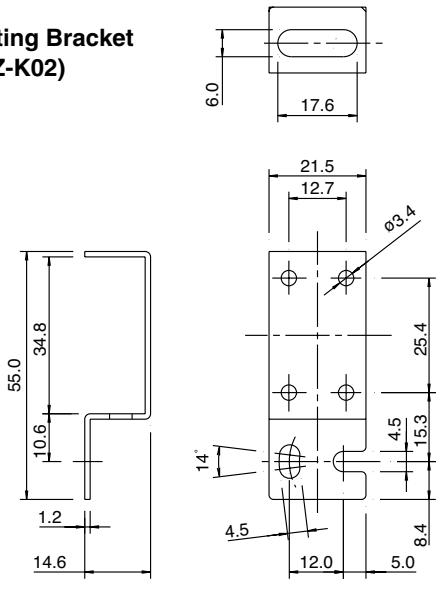


Material: Stainless Steel

• With Mounting Bracket

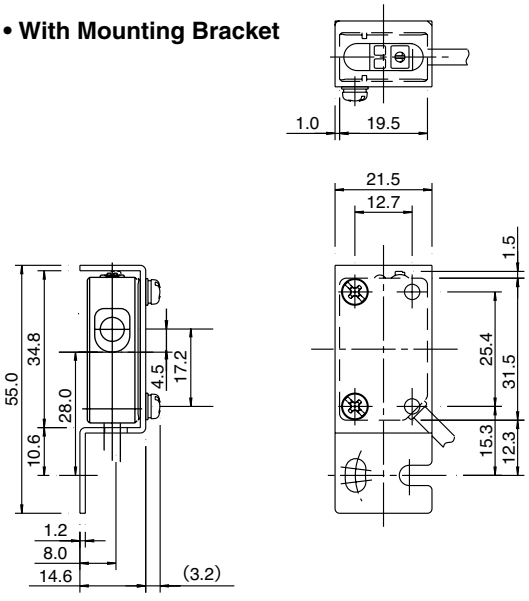


• Mounting Bracket (SA9Z-K02)



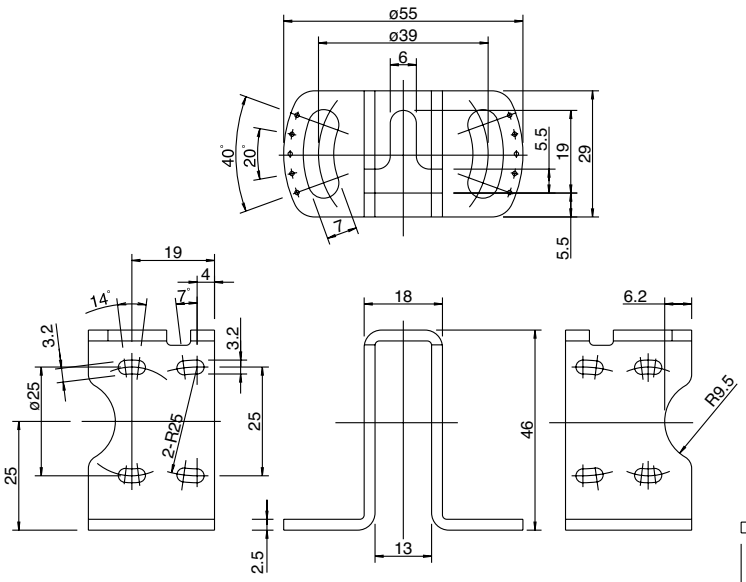
Material: Stainless Steel

• With Mounting Bracket



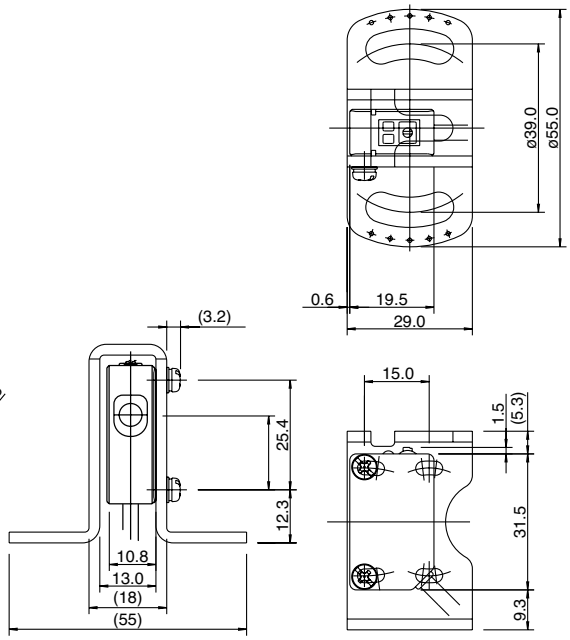
• Mounting Bracket (SA9Z-K03)

All dimensions in mm.

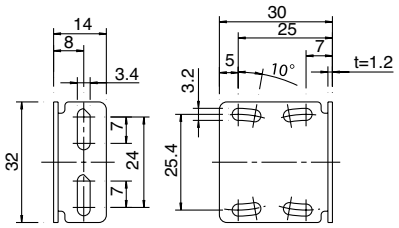


Material: Stainless Steel

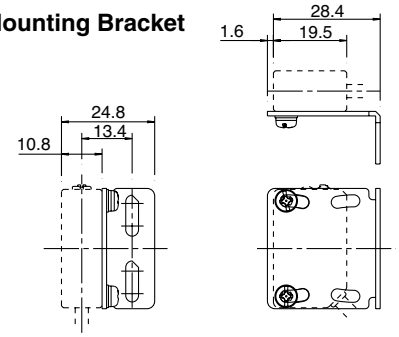
• With Mounting Bracket



• Mounting Bracket (SA9Z-K04)

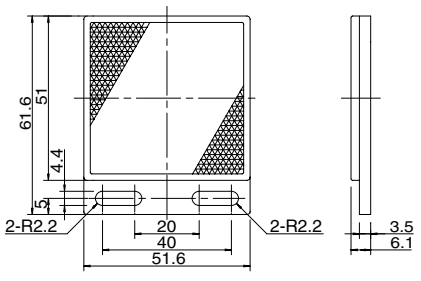


• With Mounting Bracket



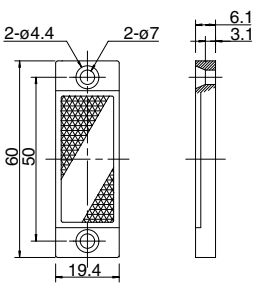
• Reflector

(IAC-R9)



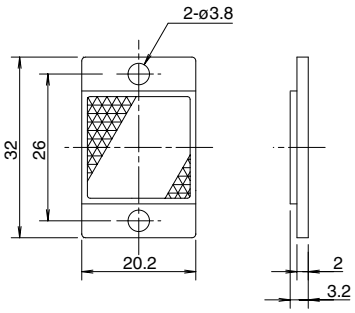
(Reflecting surface 47×47.6)

(IAC-R10)



(Reflecting surface 38.5×16)

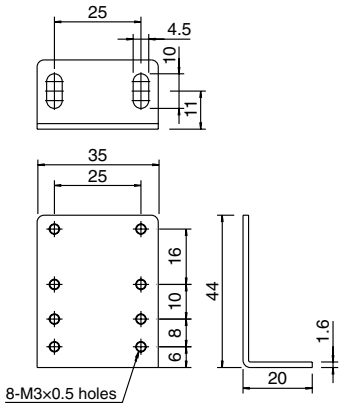
(IAC-R11)



(Reflecting surface 18×18.2)

• Reflector Mounting Bracket IAC-L3 (for IAC-R9)

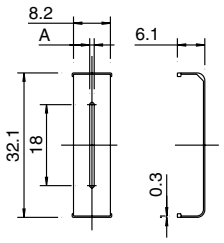
All dimensions in mm.



Material: SPCC

• Slit (Vertical Slit) SA9Z-S06, -S07, -S08

All dimensions in mm.

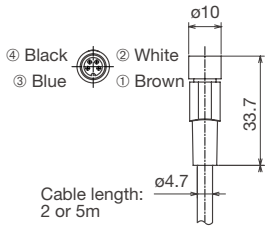


Material: Stainless Steel

Slit	
Type No.	Slit Width: A
SA9Z-S06	0.5 mm
SA9Z-S07	1.0 mm
SA9Z-S08	2.0 mm

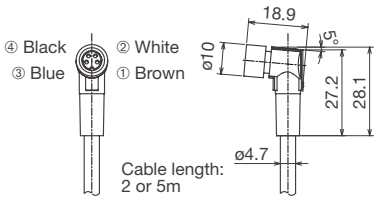
• Connector Cable Straight Type SA9Z-CM8K-4S☐

All dimensions in mm.



Note: Dielectric strength when installed on the SA1E-X
Between live part and mounting bracket: 1,000V AC
(except between live part and clamp ring)

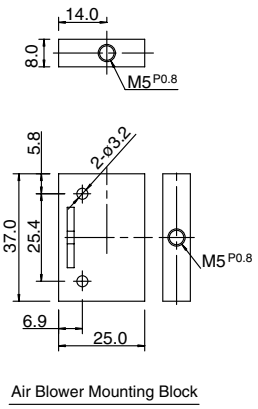
Right-Angle Type SA9Z-CM8K-4L☐



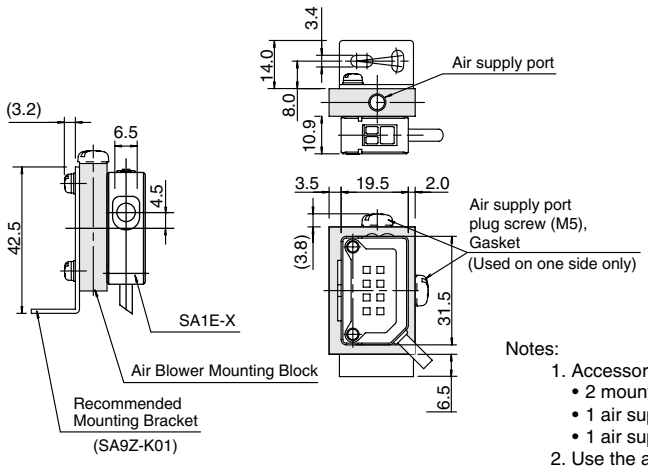
Note: Dielectric strength when installed on the SA1E-X
Between live part and mounting bracket: 1,000V AC
(except between live part and clamp ring)

• Air Blower Mounting Block SA9Z-A02

All dimensions in mm.



• With Mounting Bracket



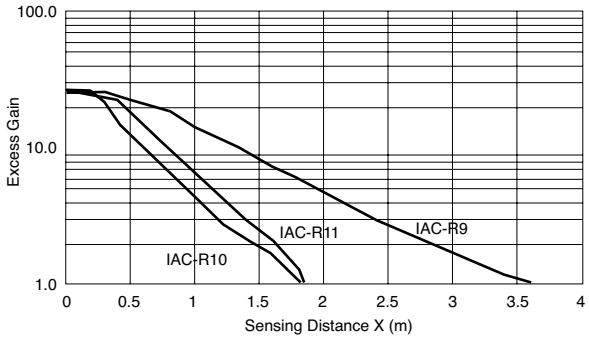
Material: Aluminum (anodized)

Notes:

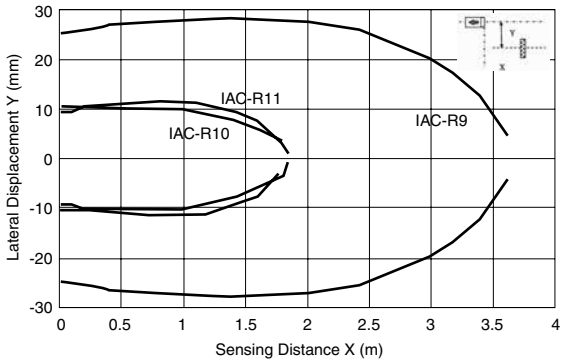
1. Accessories
   - 2 mounting screws (M3 × 20 mm sems screws)
   - 1 air supply port plug screw (M5 × 6 screw)
   - 1 air supply port plug gasket (1 mm thick)
2. Use the air supply port plug screw and gasket in either direction.
   Tightening torque: 0.5 N·m maximum
3. Air tube fitting and mounting bracket are not supplied.
   (recommended mounting bracket: SA9Z-K01)

Characteristics

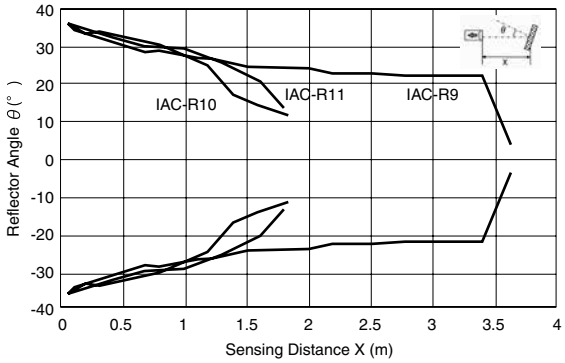
• Excess Gain



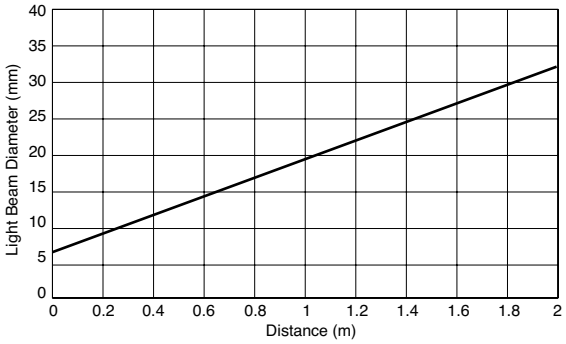
• Lateral Displacement



• Angle



• Light Beam Diameter



Instructions

LED Indicator and Output Operation

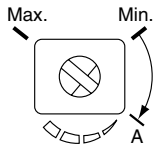
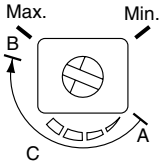
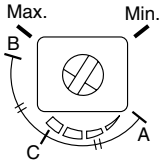
Light Reception Status	Operation LED (Yellow)/Output Operation	
	Light ON	Dark ON
Receiving light (No object detected)	Illuminated (Output ON)	Not illuminated (Output OFF)
Light interrupted (Object detected)	Not illuminated (Output OFF)	Illuminated (Output ON)

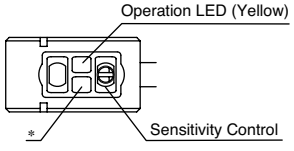
Optical Axis Alignment (Light ON)

Install the reflector perpendicularly to the optical axis. Move the SA1E-X photoelectric switch up, down, right and left to find the range where the operation LED turns on. Fasten the SA1E-X in the middle of the range. The SA1E-X can also be installed by finding the position where the reflection of projected red light is most intense, while observing the reflection on the reflector from behind the switch.

Sensitivity Adjustment (Light ON)

Sensitivity is set to the maximum at the factory before shipment. Referring to the table on the right, adjust the sensitivity. The table explains the status of the operation LED when the operation mode is set to light ON. After adjusting the sensitivity, make sure that the operation LED and control output turn on at stable incident and turn off at stable interruption. When adjusting the sensitivity, use a screwdriver matching the slot in the knob to turn the sensitivity control, with a maximum torque of 0.05 N·m. An optional sensitivity control screwdriver (SA9Z-AD01) is also available. If the distance from the reflector is too short to adjust the sensitivity, use of a vertical slit (SA9Z-S06, -S07, -S08) is recommended. (See page 6.)

Step	Photoelectric Switch Status	Sensitivity Control	Adjusting Procedure
①	Receiving light (No object detected)		Turn the control counterclockwise to the minimum. Then turn clockwise until the operation LED turns on (turns off with dark ON type) (point A).
②	Light interrupted (Object detected)		At interruption status, turn the control clockwise from point A, until the operation LED turns on (turns off with dark ON type) (point B). If the operation LED does not turn on (turn off with dark ON type) even though the control has reached the maximum, set the maximum position as point B.
③	—		Once points A and B have been determined, set the control midway between points A and B (point C). Temporarily turn the control counterclockwise until the operation LED turns off and set the control back to point C. When points A and B are close to each other, set the control at point A.



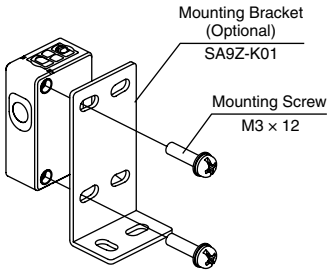
* Stable LED is not provided on the SA1E-X.

Power Supply and Wiring

- Do not use the SA1E-X photoelectric switch during the transient status, immediately after turning on the power (approx. 100 ms). When the load and sensor use different power supplies, make sure to power up the sensor first.
- Use a power supply with little noise and inrush current, and use the photoelectric switch within the rated voltage range. Make sure that the ripple factor is within the allowable limit. Do not apply AC voltage, otherwise the switch may blow out or burn.
- When using a switching power supply, make sure to ground the frame ground (FG) terminal, otherwise high-frequency noise may affect the photoelectric switch.
- Turn the power off before inserting or removing the connector on the photoelectric switch. Make sure that excessive mechanical force is not applied to the connector. Tighten the connector cable ring to a maximum tightening torque of 0.5 N·m.
- To ensure sufficient protection, use the connector cable that is applicable for the connector type. Connector cables are ordered separately.
- Avoid parallel wiring with high-voltage or power lines in the same conduit, otherwise noise may cause malfunction and damage.
- When wiring is long, use a separate conduit for wiring.
- Use a cable that has core wires of a minimum of 0.3 mm^2, then the cable can be extended up to 100m.

Notes on Installation

- Do not install the SA1E-X photoelectric switches in an area where the switches are subject to the following conditions, otherwise malfunction and damage may occur.
  1) Inductive devices or heat sources
  2) Extreme vibration or shock
  3) Large amounts of dust
  4) Toxic gases
  5) Water, oil, chemicals
  6) Outdoors
- Do not expose the receiver of the sensor to sunlight or fluorescent lamps.
- The interference prevention function allows installation of two units adjacent to each other.
- The degree of protection of the sensor is IP67, but do not use the sensor with drops of water remaining on the lens.
- Note that the optical components use polycarbonate and acrylic resin, which dissolves in ammonia, caustic soda, benzene, etc. Remove any soiling on the optical components with a dry, soft cloth.
- Excessive tightening of the mounting screws or hammering of the SA1E-X when installing may deteriorate the performance of the housing. Make sure that the tightening torque for mounting screws (M3 screws) is 0.5 N·m or less.



- Note that excessive tightening of screws when installing a reflector may damage the screw holes in the reflector. Make sure that the tightening torque for mounting screws (M3 screws) is 0.5 N·m or less.
- If the SA1E-X is used in a place subject to large variations in the ambient temperature, the characteristics may change depending on the target object. Be sure to check the operation under the actual operating conditions.

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