IDEC

Think Automation and beyond...

SA1E Miniature Photoelectric Switches (Built-in Amlifier)

User-friendly, higih-performance photoelectric switches


Through-beam


Polarized retro-reflective


Diffuse-reflective


Background suppression (BGS)

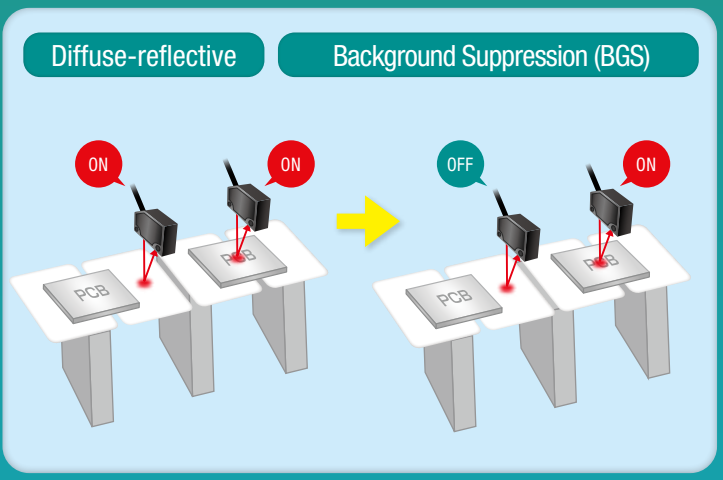
IDEC CORPORATION

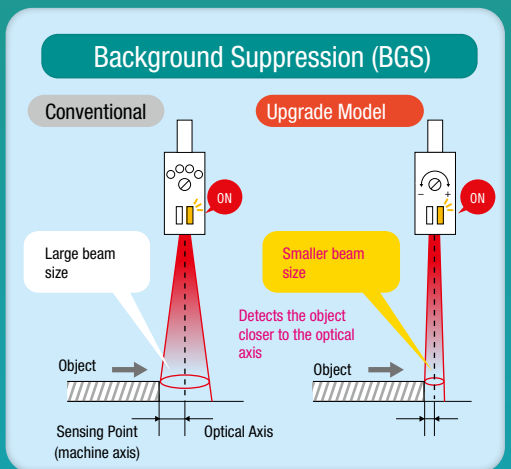
SA1E

Miniature Photoelectric Switches
(Built-in Amplifier)

Background Suppression (BGS)

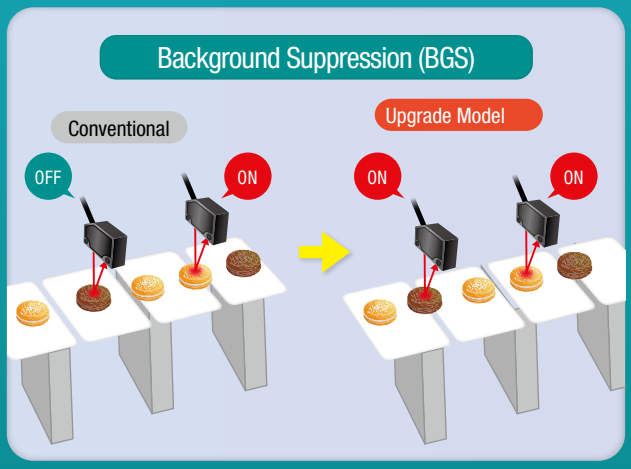
Ignores the background and detects the objects only. Smaller beam makes it possible to detect small objects and narrow gaps between the objects. The upgraded model is also less affected by the object colors.





Detects objects of different colors

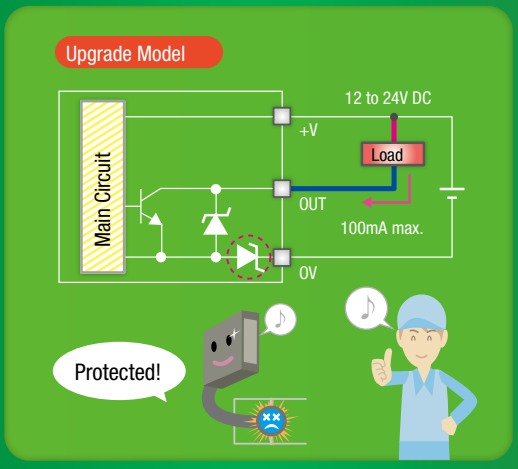
The improved sensing ability detects objects of different colors such as black and white more accurately.



Output reverse-polarity protection circuit

Several SA1E models are protected from incorrect wiring:

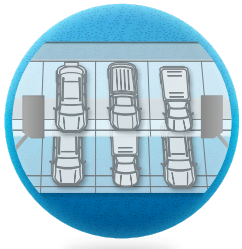
- Through-beam
- Polarized retro-reflective
- Diffuse-reflective
- Background Suppression (BGS)
- Small-beam Reflective



Application Examples

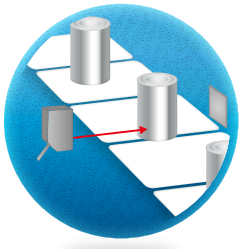
Through-beam

Multi-story parking lot



Polarized Retro-reflective

Mirror-like objects

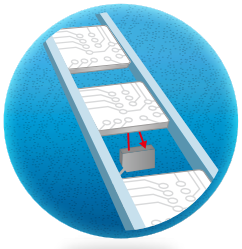


Diffuse-reflective

Automatic faucet

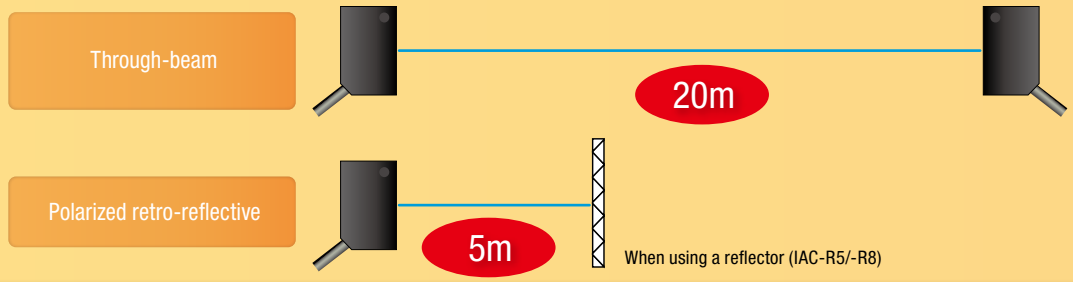
Background Suppression (BGS)

PCB line



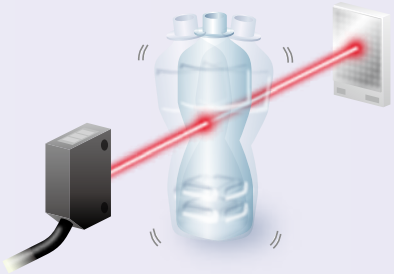
Upgraded SA1E

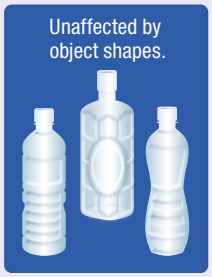
Long Distance Detection



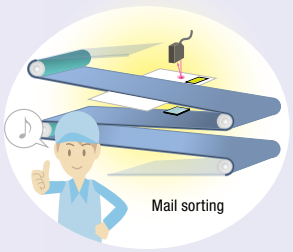
Coaxial Polarized Retro-reflective (Transparent Object Sensing)

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



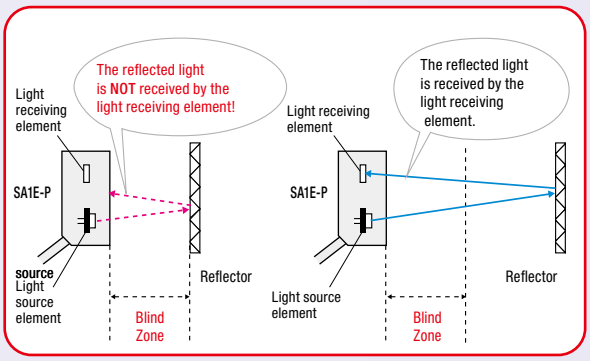


Aplication Example

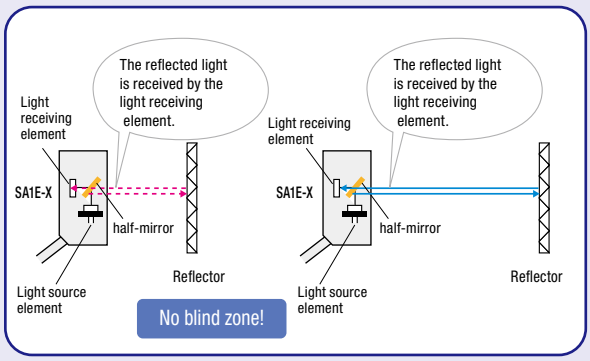


Because the SA1E-X co-axial polarized retroreflective model does not have blind zone, where the reflected light misses the light receiving element, like the SA1E-P polarized retro-reflective type, the SA1E-X can be used in applications where objects pass near the sensor.

Polarized Retro-reflective (non-coaxial)

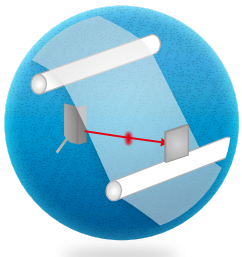


Coaxial Polarized Retro-reflective

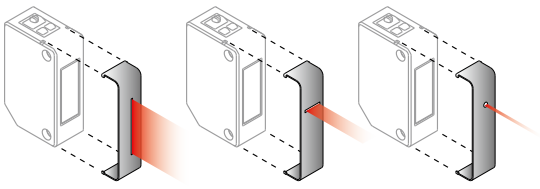


Coaxial Polarized Retro-reflective

Transparent film edge detection



Various accessories



Slits for through-beam model

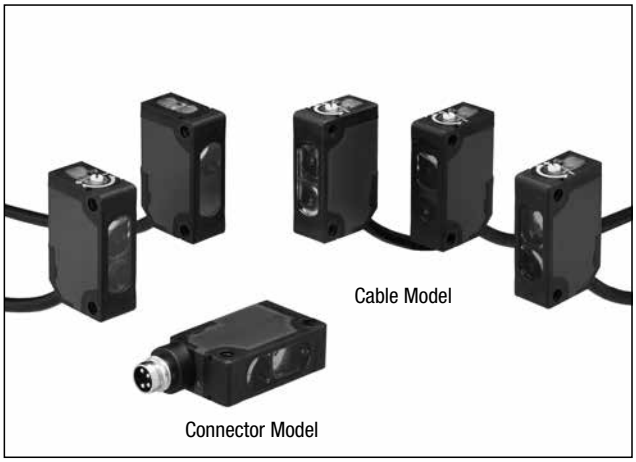
Mounting brackets

- 9 types of slits for through-beam model
- 4 types of mounting brackets
- 8 types of reflectors for coaxial polarized retro-reflective model
- Air blower mounting block

SA1E Miniature Photoelectric Switches (Built-in Amplifier)

Simple, compact design for world-wide usage.

- Six sensing methods
- Cable model (three cable lengths) and M8 connector models are available.
- NPN output, PNP output, light ON, dark ON can be selected.
- Sensing range doubled with SA1E-T through-beam and SA1E-P polarized retro-reflective models.
- Highly stable with excellent resistance against vibration and shock resistance.
- Coaxial polarized retro-reflective model (SA1E-X) ensures stable detection, unaffected by construction, inclination or shaking of the object, and a high-speed response and small beam ensure reliable counting of target objects moving at high speed.
- Air blower mounting block for installing an air blower to clean the lens surface. Ideal to maintain a clean lens surface and sensor performance.
- Nine types of slits for through-beam models available.
- CE marked, UL listed.



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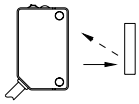
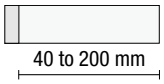
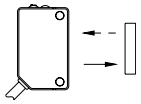
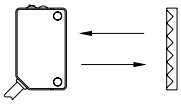
Package Quantity: 1

Sensing Method	Sensing Range	Connection	Cable Length	Operation Mode	Part No.	
					NPN Output	PNP Output
Through-beam / Infrared LED / w/Sensitivity Adjustment	20m See the characteristics on page 15.	Cable	1m	Light ON	SA1E-TN1	SA1E-TP1
				Dark ON	SA1E-TN2	SA1E-TP2
			2m	Light ON	SA1E-TN1-2M	SA1E-TP1-2M
				Dark ON	SA1E-TN2-2M	SA1E-TP2-2M
			5m	Light ON	SA1E-TN1-5M	SA1E-TP1-5M
				Dark ON	SA1E-TN2-5M	SA1E-TP2-5M
		M8 Connector	—	Light ON	SA1E-TN1C	SA1E-TP1C
				Dark ON	SA1E-TN2C	SA1E-TP2C
Polarized Retro-reflective / Red LED / w/Sensitivity Adjustment	5.0m (50mm) When using IAC-R5/R8 3.0m (50mm) When using IAC-R6 2.0m (150mm) When using IAC-RS2 1.3m (150mm) When using IAC-RS1 1.6m (100mm) When using IAC-R7□ Note: Maintain at least the distance shown in the ( ) between the SA1E photoelectric switch and reflector. Reflectors are not supplied and must be ordered separately. See the characteristics on page 16.	Cable	1m	Light ON	SA1E-PN1	SA1E-PP1
				Dark ON	SA1E-PN2	SA1E-PP2
			2m	Light ON	SA1E-PN1-2M	SA1E-PP1-2M
				Dark ON	SA1E-PN2-2M	SA1E-PP2-2M
			5m	Light ON	SA1E-PN1-5M	SA1E-PP1-5M
				Dark ON	SA1E-PN2-5M	SA1E-PP2-5M
		M8 Connector	—	Light ON	SA1E-PN1C	SA1E-PP1C
				Dark ON	SA1E-PN2C	SA1E-PP2C
Diffuse-reflective / Infrared LED / w/Sensitivity Adjustment	700 mm See the characteristics on page 16.	Cable	1m	Light ON	SA1E-DN1	SA1E-DP1
				Dark ON	SA1E-DN2	SA1E-DP2
			2m	Light ON	SA1E-DN1-2M	SA1E-DP1-2M
				Dark ON	SA1E-DN2-2M	SA1E-DP2-2M
			5m	Light ON	SA1E-DN1-5M	SA1E-DP1-5M
				Dark ON	SA1E-DN2-5M	SA1E-DP2-5M
		M8 Connector	—	Light ON	SA1E-DN1C	SA1E-DP1C
				Dark ON	SA1E-DN2C	SA1E-DP2C

Package Quantity: 1

Sensing Method				Sensing Range	Connection	Cable Length	Operation Mode	Part No.	
								NPN Output	PNP Output
Background Suppression	Red LED	w/Sensing Range Adjustment		 Adjustable Sensing Range See the characteristics on page 16.	Cable	1m	Light ON	SA1E-BN1	SA1E-BP1
							Dark ON	SA1E-BN2	SA1E-BP2
						2m	Light ON	SA1E-BN1-2M	SA1E-BP1-2M
							Dark ON	SA1E-BN2-2M	SA1E-BP2-2M
						5m	Light ON	SA1E-BN1-5M	SA1E-BP1-5M
							Dark ON	SA1E-BN2-5M	SA1E-BP2-5M
					M8 Connector	—	Light ON	SA1E-BN1C	SA1E-BP1C
							Dark ON	SA1E-BN2C	SA1E-BP2C
Small-beam Reflective	Red LED	w/Sensitivity Adjustment		50 to 150 mm See the characteristics on page 16.	Cable	1m	Light ON	SA1E-NN1	SA1E-NP1
							Dark ON	SA1E-NN2	SA1E-NP2
						2m	Light ON	SA1E-NN1-2M	SA1E-NP1-2M
							Dark ON	SA1E-NN2-2M	SA1E-NP2-2M
						5m	Light ON	SA1E-NN1-5M	SA1E-NP1-5M
							Dark ON	SA1E-NN2-5M	SA1E-NP2-5M
					M8 Connector	—	Light ON	SA1E-NN1C	SA1E-NP1C
							Dark ON	SA1E-NN2C	SA1E-NP2C
Coaxial Polarized Retro-reflective	Red LED	With Sensitivity Adjustment	 Note: Reflector is not supplied and must be ordered separately.	2.0m (when using IAC-R9) 1.0m [100 mm] (when using IAC-R10) 1.0m [100 mm] (when using IAC-R11) See the characteristics on page 17.	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
					M8 Connector	—	Light ON	SA1E-XN1C	SA1E-XP1C
							Dark ON	SA1E-XN2C	SA1E-XP2C

Accessories (optional)

Accessories (optional)

Slits (for through-beam)

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

Reflectors (for polarized retro-reflective)

Item		Part No.	Package Quantity
Reflector	Standard	IAC-R5	1
	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 × 35 mm)	IAC-RS1	
	Tape Type (80 × 70 mm)	IAC-RS2	
Reflector Mounting Bracket	For IAC-R5	IAC-L2	
	For IAC-R6	IAC-L3	
	For IAC-R8	IAC-L5	

- See page 13 for dimensions.
- The IAC-L2 is not supplied with mounting screws and nuts. Use commercially available M4 screws and nuts for mounting the IAC-R5 reflector.
- The IAC-L3 is supplied with two mounting screws (M3 × 8 mm sems screws).
- The IAC-L5 is supplied with two mounting screws (M4 × 10 mm sems screws).
- The IAC-R7M and IAC-R7S are supplied with two M3 × 8 mm self-tapping screws, two flat washers, and two spring washers.
- The IAC-R7B is supplied with an M3 × 8 mm self-tapping screw, a flat washer, and a spring washer.

Sensor Mounting Brackets

Item		Part No.	Package Quantity
Main Unit Mounting Brackets	Vertical Mounting	SA9Z-K01	1
	Horizontal Mounting	SA9Z-K02	
	Cover type	SA9Z-K03	
	Back Mounting	SA9Z-K04	

- Two mounting screws (M3 × 12 mm sems screws) are supplied with the SA9Z-K01 and SA9Z-K02.
- Two mounting screws (M3 × 14 mm 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 for the connector models.
- Contact IDEC about mounting brackets for the connector.

Connector Cable (for M8 connector model)

Number of Core Wires	Style & Length	Part No.	Package Quantity
4	Straight, 2m	SA9Z-CM8K-4S2	1
	Right angle, 2m	SA9Z-CM8K-4L2	
	Straight, 5m	SA9Z-CM8K-4S5	
	Right angle, 5m	SA9Z-CM8K-4L5	

Reflectors (used only for coaxial polarized retro-reflective)

Item		Part No.	Package Quantity
Reflector	Standard	IAC-R9	1
	Small	IAC-R10	
	Ultra-small	IAC-R11	
Reflector Mounting Bracket	For IAC-R9	IAC-L3	

Air Blower Mounting Block

Item	Part No.	Package Quantity
Air Blower Mounting Block	SA9Z–A02	1

- Two mounting screws (M3 × 20 mm sems screws), one M5 × 6 mm screw for plugging the air supply port, and one gasket (0.5 mm 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

Item	Part No.	Package Quantity
Sensitivity Control Screwdriver 	SA9Z-AD01	1

Specifications

Sensing Method		Through-beam	Polarized Retro-reflective
Part No.		SA1E-T□	SA1E-P□
Power Voltage		12 to 24V DC (Operating range: 10 to 30V DC) equipped with reverse-polarity protection	
Current Draw		Projector: 15 mA Receiver: 20 mA	30mA
Sensing Range		20m	5.0m (IAC-R5/R8) 3.0m (IAC-R6) 2.0m (IAC-RS2) 1.3m (IAC-RS1) 1.6m (IAC-R7□) (Note 1)
Adjustable Sensing Range		—	
Detectable Object		Opaque	Opaque/mirror-like objects
Hysteresis		—	
Response Time		1 ms maximum	
Sensitivity Adjustment		Adjustable using a potentiometer (approx. 240°) Through-beam and polarized retro-reflective models are also available without sensitivity adjustment.	
Sensing Range Adjustment		—	
Light Source Element		Infrared LED	Red LED
Operation Mode		Light ON/Dark ON	
Control Output		NPN open collector or PNP open collector (30V DC, 100 mA maximum, short-circuit protection)	
		Voltage drop: 2V max. (30V DC, 100 mA max) 1.2V max. (30V DC, 10 mA max) With output reverse connection protection control circuit	
LED Indicators		Operation LED: Yellow Stable LED: Green Power LED: Green (Through-beam model projector)	
Interference Prevention		—	Two units can be mounted in close proximity.
Degree of Protection		IP67 (IEC 60529)	
Extraneous Light Immunity		Sunlight: 10,000 lx 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 maximum (500V DC megger)	
Dielectric Strength		Between live part and mounting bracket: 1000V AC, 50/60 Hz, 1 minute	
Vibration Resistance		Damage limits: 10 to 500 Hz, 90 m/s^2, 1 cycle 5 mins, in each of 3 axes	
Shock Resistance		Damage limits: 1000 m/s^2, 6 shocks in each of 3 axes	
Material	Case	PC/PBT	
	Lens	PMMA	
	Indicator Model	PC	
Weight (approx.)	Cable Model	Projector: 30g , Receiver: 30g (Note 2)	30g (Note 2)
	Connector Model	Projector: 10g, Receiver: 10g	10g
Connection Method	Cable Model	ø3.5 mm, 2-core, 0.2 mm^2 cable	ø3.5 mm, 3-core, 0.2 mm^2 cable
	Connector Model	M8 connector (4-pin)	

Note 1: Maintain at least the distance shown below between the SA1E photoelectric switch and reflector.
IAC-R5/R6/R8: 50 mm
IAC-R7: 100 mm
IAC-RS1/RS2: 150 mm
The detection distance cannot be guaranteed if the reflector is deformed or the tape type reflector is applied on uneven surface.
Note 2: Cable length: 1m (50g when the cable length is 2m. 110g when the cable length is 5m.)

Specifications

Sensing Method		Diffuse-reflective	Background Suppression (BGS)	Small-beam Reflective	Coaxial Polarized Retro-reflective (Transparent Object Sensing)
Part No.		SA1E-D□	SA1E-B□	SA1E-N□	SA1E-X□
Power Voltage		12 to 24V DC (Operating range: 10 to 30V DC), equipped with reverse-polarity protection			
Current Draw		30 mA			20 mA
Sensing Range		700 mm (using 200 × 200 mm white mat paper)	20 mm to preset (using 200 × 200 mm white mat paper)	50 to 150 mm (using 100 × 100 mm white mat paper)	2 m (using IAC-R9)
Adjustable Sensing Range		—	40 to 200 mm	—	
Detectable Object		Opaque/Transparent	Opaque	Opaque/Transparent	Opaque, transparent and mirror-like objects
Hysteresis		20% maximum	10% maximum	20% maximum	—
Response Time		1 ms maximum			500 µs maximum
Sensitivity Adjustment		Adjustable using a potentiometer (approx. 240°)	—	Adjustable using a potentiometer (approx. 240°)	
Sensing Range Adjustment		—	6-turn control knob	—	
Light Source Element		Infrared LED	Red LED		
Operation Mode		Light ON/Dark ON			
Control Output		NPN open collector or PNP open collector (30V DC, 100 mA maximum with short circuit protection circuit)			
		Voltage drop: 2V max. (30V DC, 100 mA) 1.2V max. (30V DC, 100 mA) Output reverse-polarity protection circuit	Voltage drop: 2V max. (30V DC, 100 mA) Output reverse-polarity protection circuit	Voltage drop: 2V max. (30V DC, 100 mA) 1.2V max. (30V DC, 100 mA) Output reverse-polarity protection circuit	Voltage drop: 2V max. (30V DC, 100mA)
LED Indicators		Operation LED: Yellow Stable LED: Green	Operation LED: Yellow	Operation LED: Yellow Stable LED: Green	Operation LED: Yellow
Interference Prevention		Two units can be mounted in close proximity.			
Degree of Protection		IP67 (IEC 60529)			
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 maximum (500V DC megger)			
Dielectric Strength		Between live part and mounting bracket: 1000V AC, 50/60 Hz, 1 minute			
Vibration Resistance		Damage limits: 10 to 500 Hz, 1 cycle 5 mins in each of 3 axes		Damage limits: 10 to 55 Hz, double amplitude 1.5mm, 20 cycles in each of 3 axes	
Shock Resistance		Damage limits: 1000 m/s², 6 shocks in each of 3 axes		Damage limits: 500 m/s², 10 shocks in each of 3 axes	
Material	Housing	PC/PBT		PBT	PC/PBT
	Lens	PMMA			
	Indicator cover	PC			
Weight (approx.)	Cable Model	30g (Note 1)	35g (Note 2)	30g (Note 1)	35g (Note 2)
	Connector Model	10g	25g	10g	20g
Connection Method	Cable Model	ø3.5 mm, 3-core, 0.2 mm² cable			
	Connector Model	M8 connector (4-pin)			

Note 1: Cable length: 1m (50g when the cable length is 2m. 110g when the cable length is 5m.)
Note 2: Cable length: 1m (55g when the cable length is 2m. 120g when the cable length is 5m.)

Slit and Sensing Range

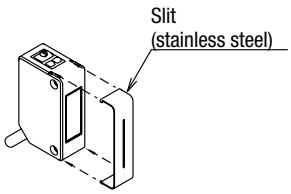
A slit, which changes the beam size of through-beam sensors, can easily be attached to the sensing side of the through-beam projector and receiver. Three different slit widths are available.

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

Note 1: At 1mm from receiver surface.

• The slit can be installed onto the front easily (see the figure at right).

The slit can be pressed to snap onto the front easily.

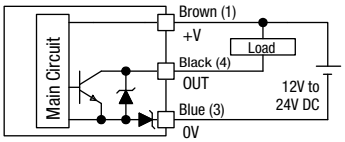


Horizontal slits and round slits have an orientation. Make sure that the TOP marking comes on top of the sensor (LED side).

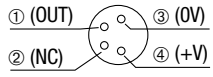
Output Circuit & Wiring Diagram

Through-beam
Polarized reflective
Diffuse-reflective
Background suppression (BGS)
Small-beam reflective

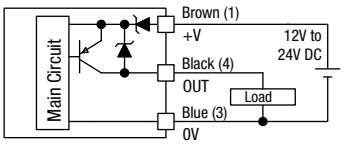
NPN Output



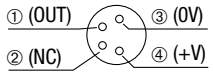
Connector Pin Assignment



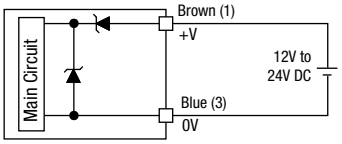
PNP Output



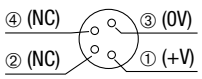
Connector Pin Assignment



Through-beam Projector

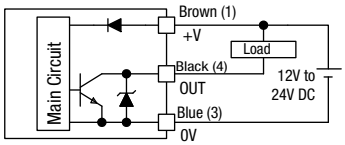


Connector Pin Assignment

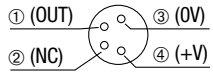


Coaxial polarized retro-reflective (Transparent Object Sensing)

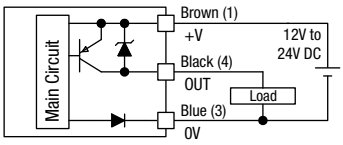
NPN Output



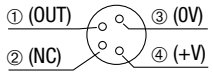
Connector Pin Assignment



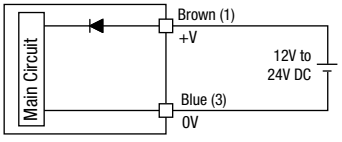
PNP Output



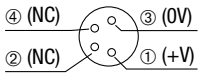
Connector Pin Assignment



Through-beam Projector



Connector Pin Assignment

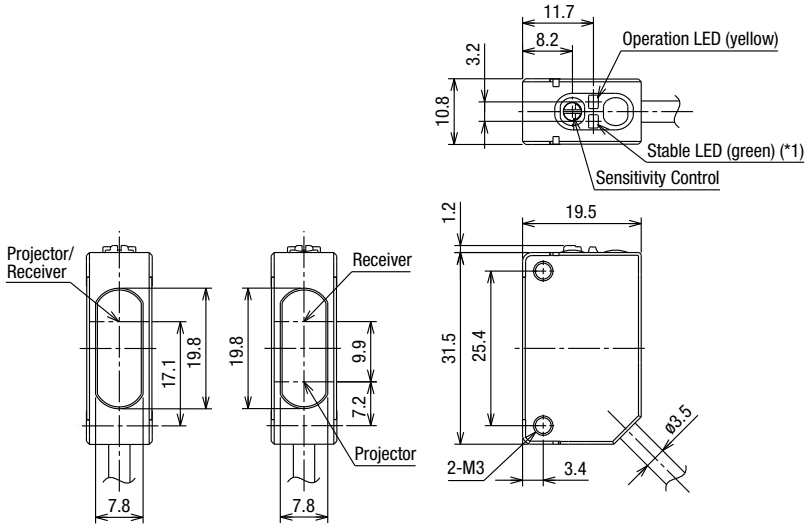


Dimensions

Dimensions

Cable Model

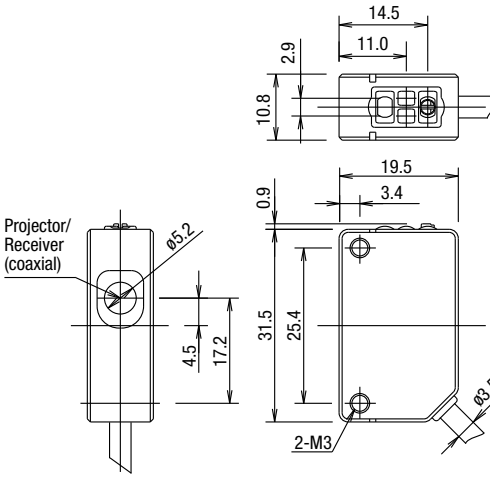
Through-beam



Polarized retro-reflective
Diffuse-reflective
Background Suppression (BGS)
Small-beam reflective

*1: Stable LED is not installet on background suppression (BGS) model.

Coaxial polarized retro-reflective
(Transparent Object Sensing)



All dimensions in mm.

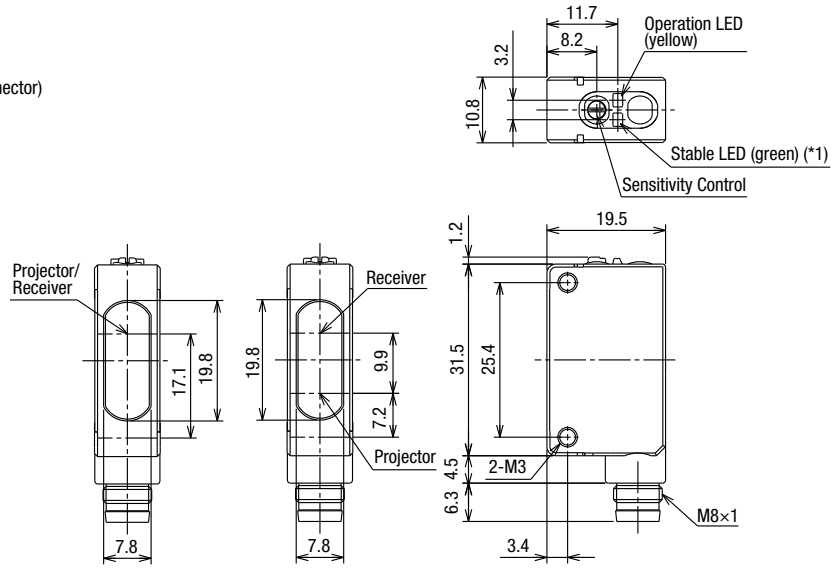
Dimensions

Dimensions

Connector Model

Through-beam

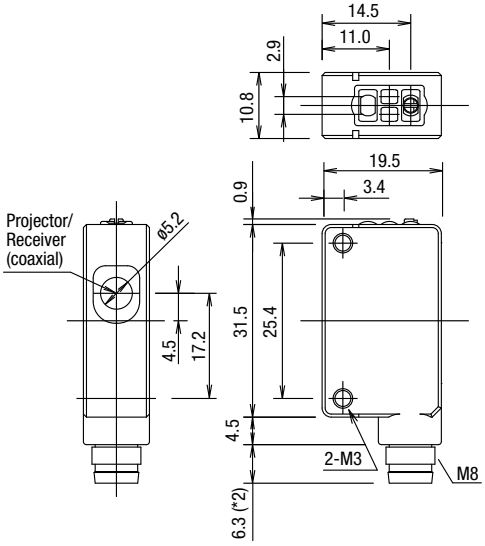
(with right angle connector)



Polarized retro-reflective
Diffuse-reflective
Background Suppression (BGS)
Small-beam reflective

*1: Stable LED is not installet on background suppression (BGS) model.

Coaxial polarized retro-reflective
(Transparent Object Sensing)



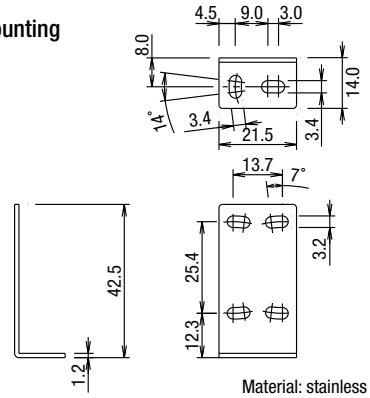
*2: The connector length is 18 mm when a right-angle connector cable (SA9Z-CM8K-4L□) is attached.

All dimensions in mm.

Accessory Dimensions

Mounting Brackets

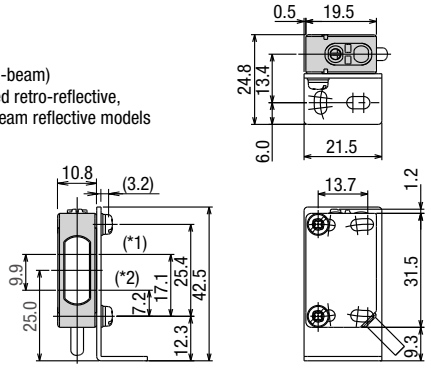
Vertical Mounting
SA9Z-K01



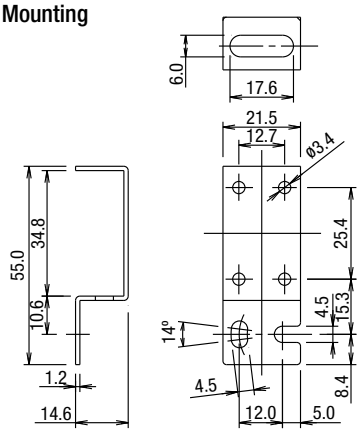
Material: stainless steel

With Mounting Bracket

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



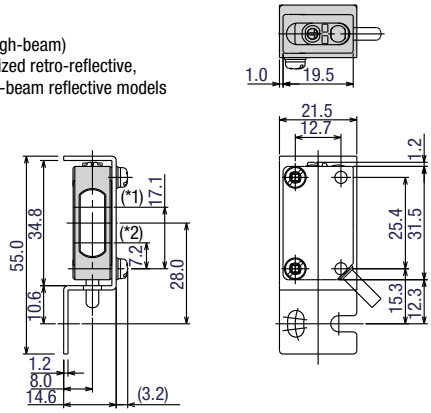
Horizontal Mounting
SA9Z-K02



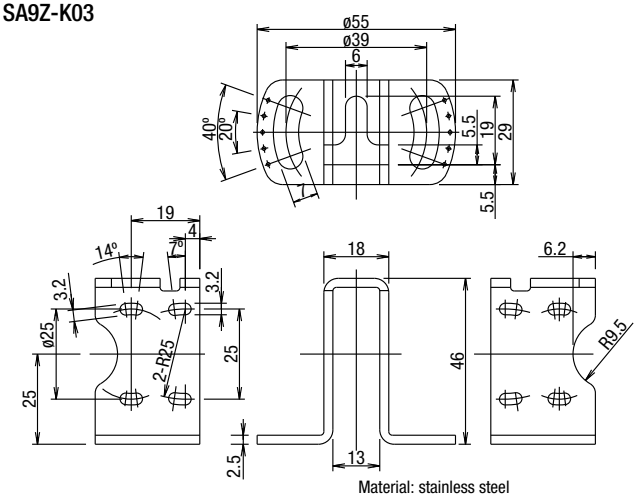
Material: stainless steel

With Mounting Bracket

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

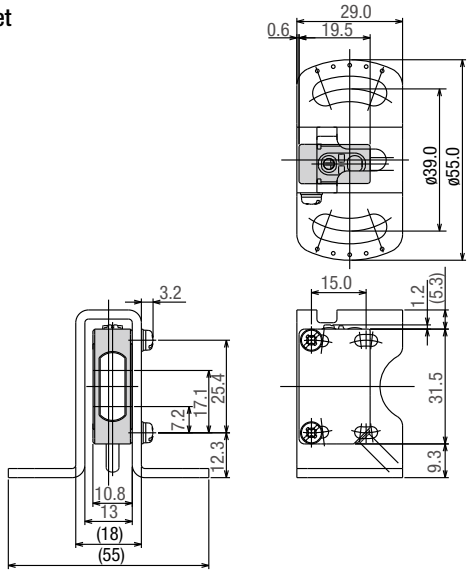


Cover Model
SA9Z-K03

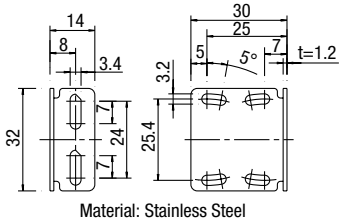


Material: stainless steel

With Mounting Bracket

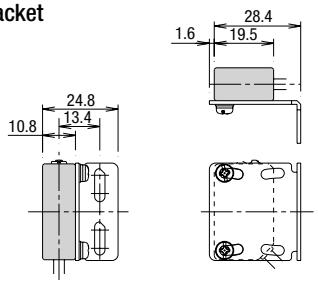


Back Mounting
SA9Z-K04



Material: Stainless Steel

With Mounting Bracket

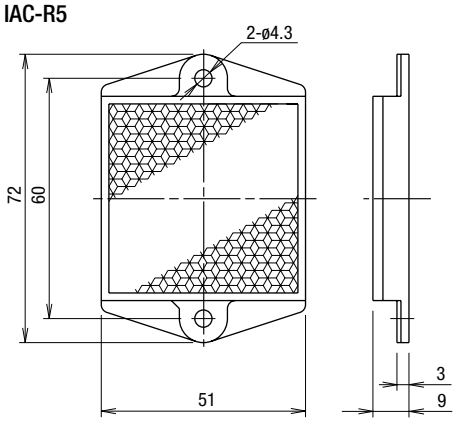


All dimensions in mm.

Accessory Dimensions

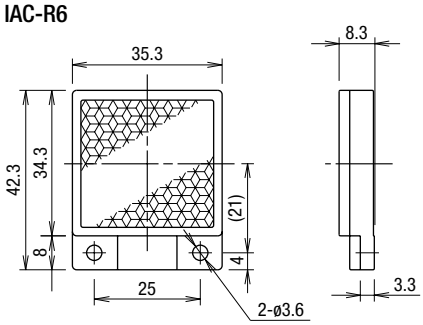
Reflectors

IAC-R5



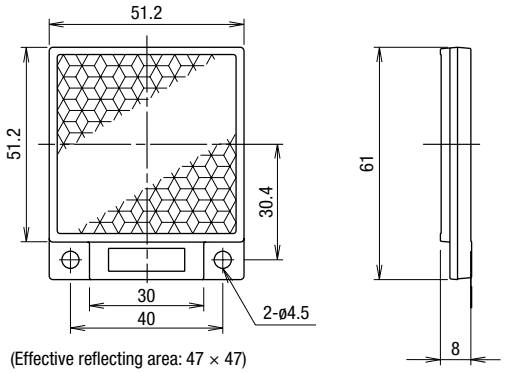
(Effective reflecting area: 47.2 × 47.2)

IAC-R6



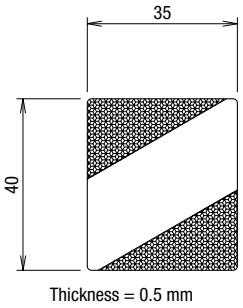
(Effective reflecting area: 30 × 31)

IAC-R8



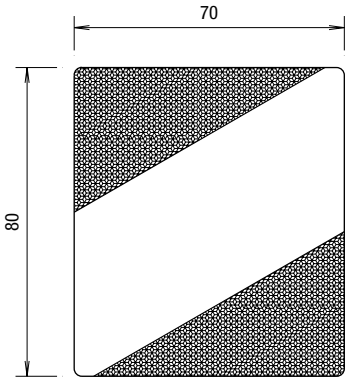
(Effective reflecting area: 47 × 47)

IAC-RS1



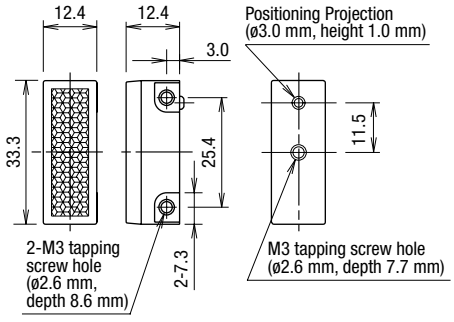
Thickness = 0.5 mm

IAC-RS2

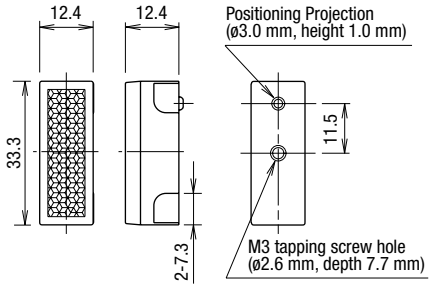


Thickness = 0.5 mm

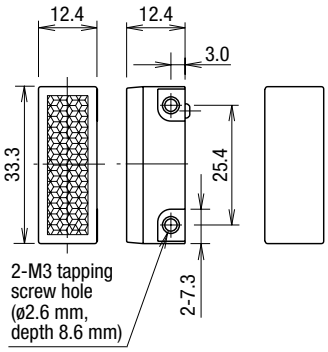
IAC-R7M (rear/side mounting)



IAC-R7B (rear mounting)

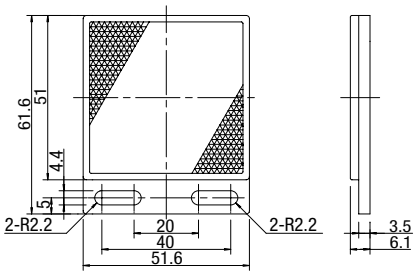


IAC-R7S (side mounting)



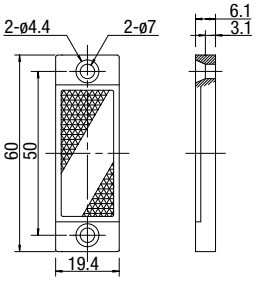
- Effective reflecting area: 8.6 × 29.5
- The mounting plate for reflector must be 0.8 to 2.5 mm in thickness.

IAC-R9



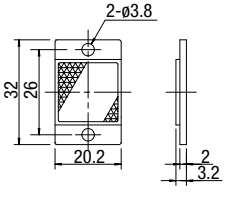
(Reflecting surface 47×47.6)

IAC-R10



(Reflecting surface 38.5×16)

IAC-R11



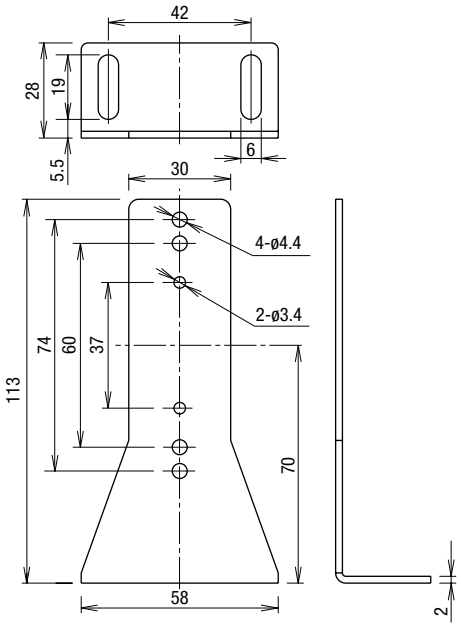
(Reflecting surface 18×18.2)

All dimensions in mm.

Accessory Dimensions

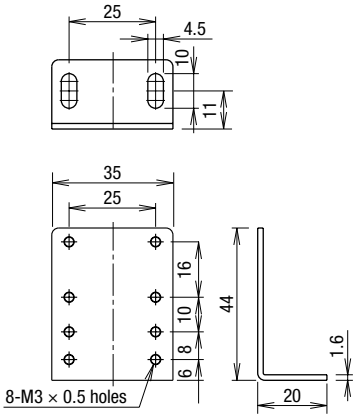
Reflector Mounting Brackets

IAC-L2 (for IAC-R5)



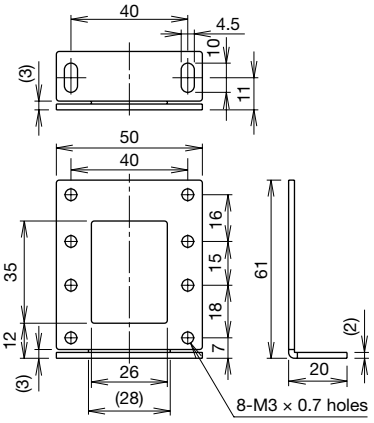
Material: SPCC (zinc chromate plating, black)

IAC-L3 (for IAC-R6)



Material: SPCC (zinc plating)

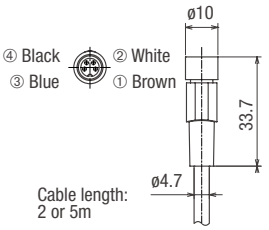
IAC-L5 (for IAC-R8)



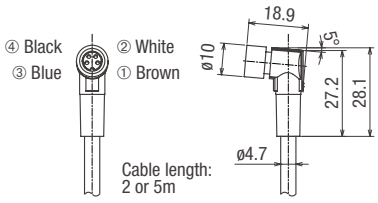
Material: SPCC (zinc plating)

Connector Cable (connector on one end)

Straight (SA9Z-CM8K-4S☐)



Right-angle (SA9Z-CM8K-4L☐)



- Dielectric strength when installed on the SA1E: 1000V AC (between live part and mounting bracket, except between live part and tightening ring)

Vertical Slit

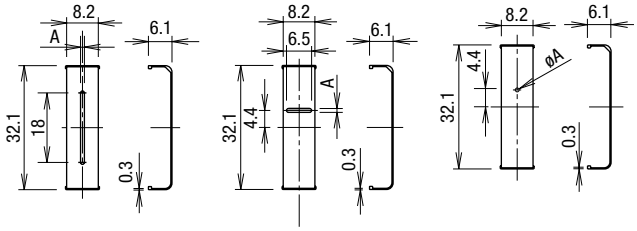
SA9Z-S06
SA9Z-S07
SA9Z-S08

Horizontal Slit

SA9Z-S09
SA9Z-S10
SA9Z-S11

Round Slit

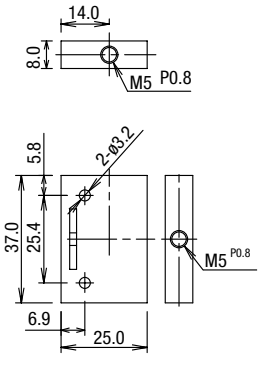
SA9Z-S12
SA9Z-S13
SA9Z-S14



Material: Stainless Steel
Note: For slit width A, see page 9.

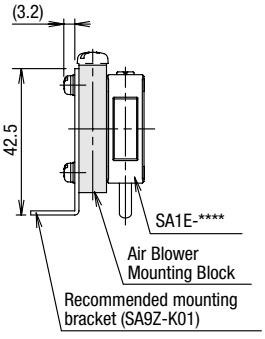
Air Blower Mounting Block

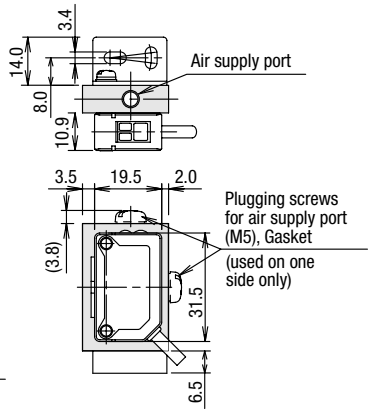
SA9Z-A02



(Material: Anodized aluminum surface)

With Mounting Bracket





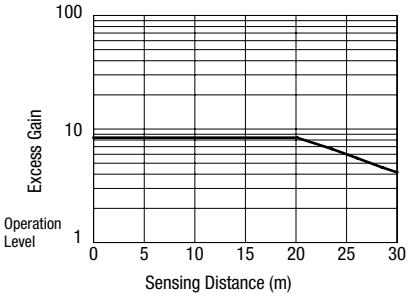
- The SA9Z-A02 air blower mounting block is supplied with two mounting screws (M3 × 20 mm sems screws), one screw for plugging the air supply port (M5 × 6 mm), and one gasket for plugging the air supply port.
- An air tube fitting (M5) can be installed to either the top or side. Tighten the fitting to 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).

All dimensions in mm.

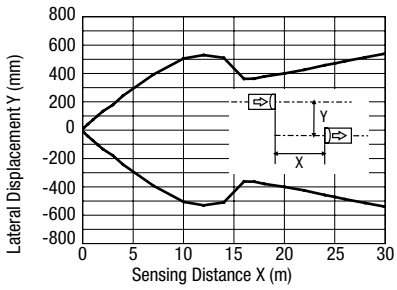
Characteristics (Typical)

1-1. Through-beam SA1E-T□

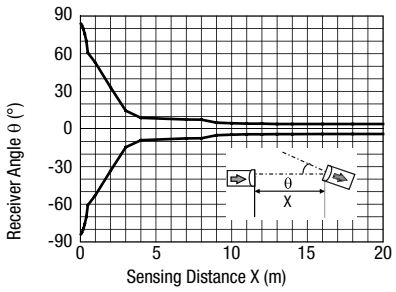
Excess Gain (Without slit)



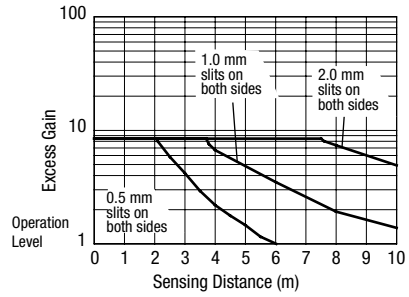
Lateral Displacement (Without slit)



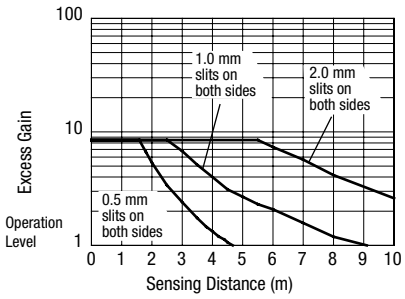
Angle (Without slit)



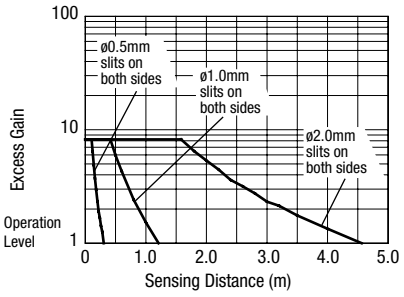
Excess Gain (With vertical slit)



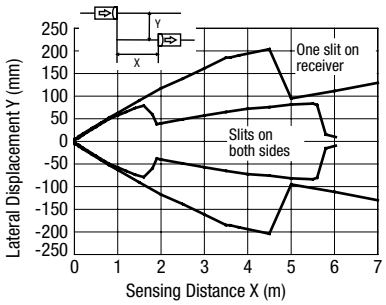
Excess Gain (With horizontal slit)



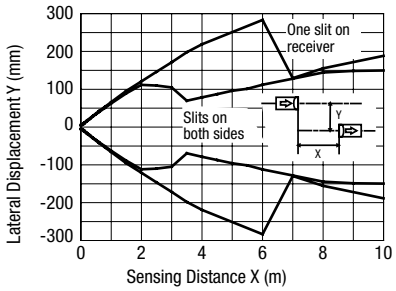
Excess Gain (With round slit)



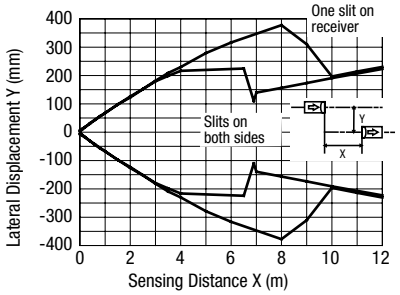
Lateral Displacement (With 0.5-mm vertical slit)



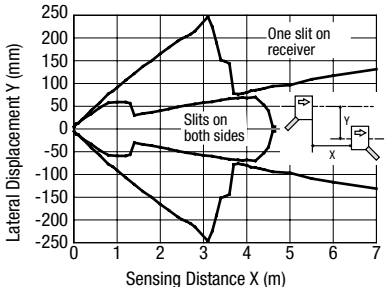
Lateral Displacement (With 1.0-mm vertical slit)



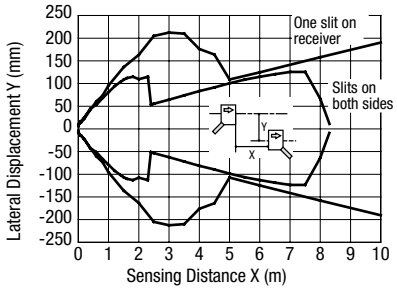
Lateral Displacement (With 2.0-mm vertical slit)



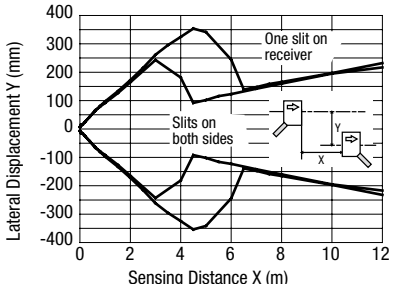
Lateral Displacement (With 0.5-mm horizontal slit)



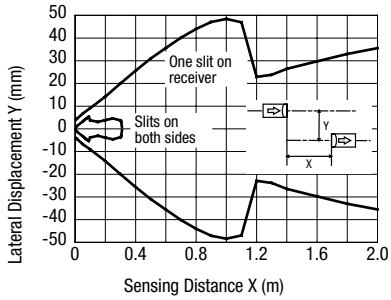
Lateral Displacement (With 1.0-mm horizontal slit)



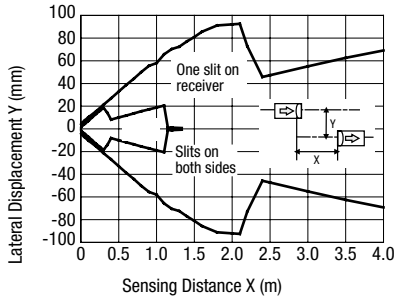
Lateral Displacement (With 2.0-mm horizontal slit)



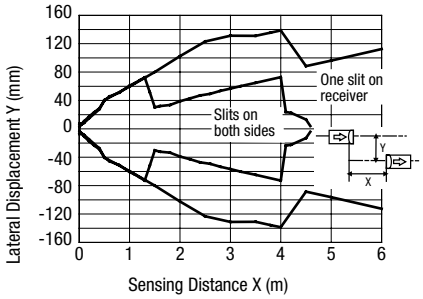
Lateral Displacement (With ø0.5-mm round slit)



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



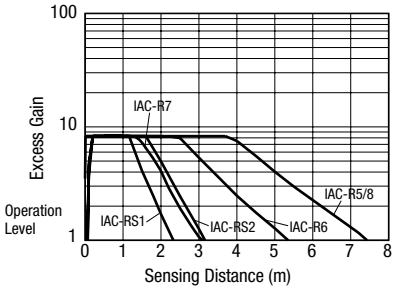
Lateral Displacement (With ø2.0-mm round slit)



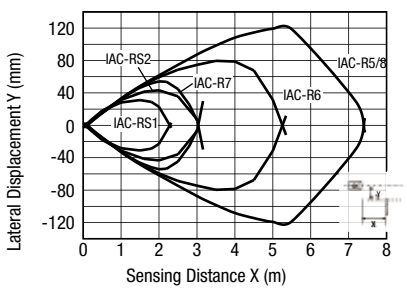
Characteristics (Typical)

2. Polarized Retro-reflective SA1E-P☐

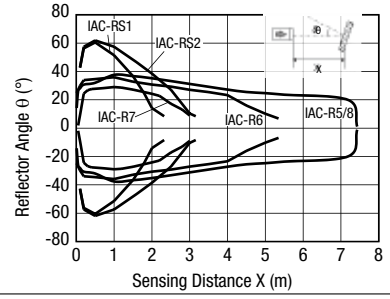
Excess Gain



Lateral Displacement

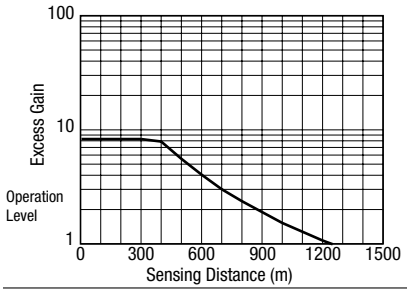


Angle (when using IAC-R5/-R8)

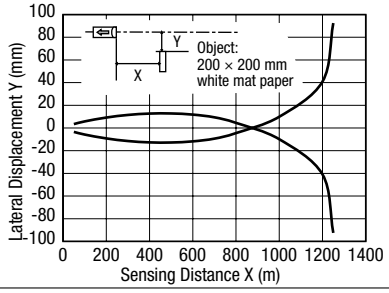


3. Diffuse-Reflective SA1E-D☐

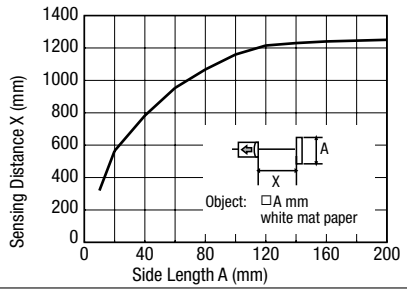
Excess Gain



Lateral Displacement

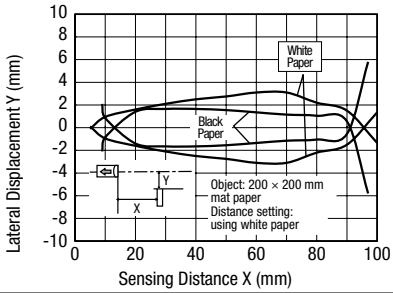


Angle (when using IAC-R5/-R8)

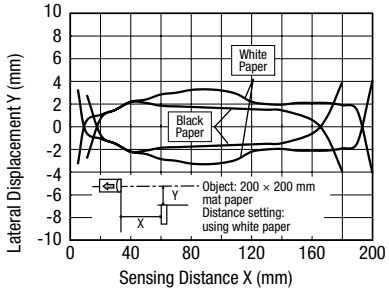


4. Background Suppression SA1E-B☐

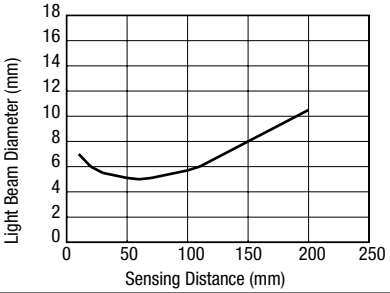
Lateral Displacement (Preset 100 mm)



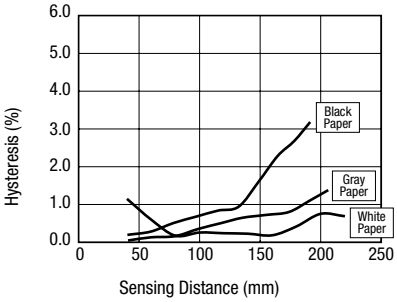
Lateral Displacement (Preset 200 mm)



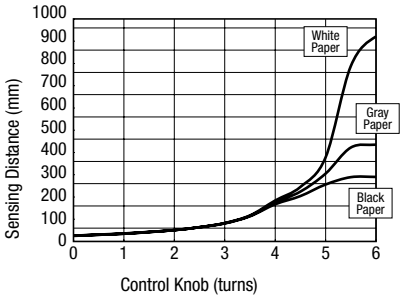
Light Beam Diameter



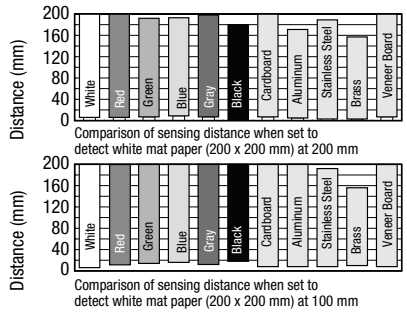
Sensing Distance vs. Hysteresis



Control Knob vs. Sensing Distance

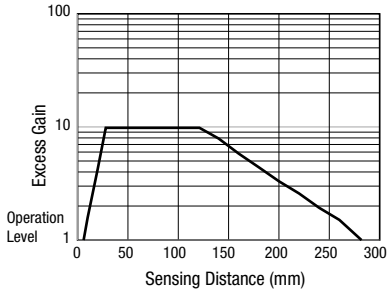


Color Matte Paper and Other Materials

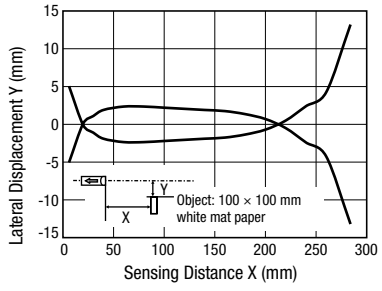


5. Small-beam Reflective SA1E-N☐

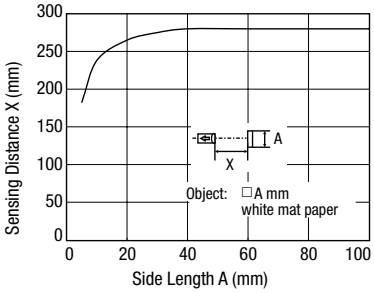
Excess Gain



Lateral Displacement

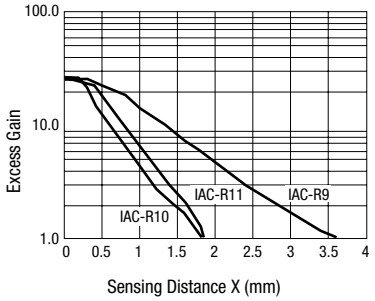


Object Size vs Sensing Distance

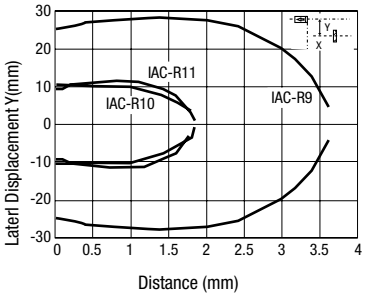


6. Coaxial Polarized Retro-reflective SA1E-X□

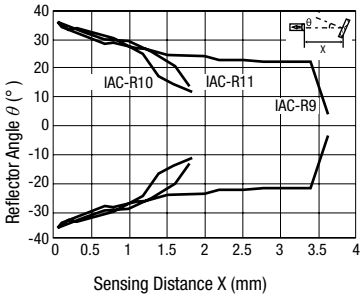
Excess Gain



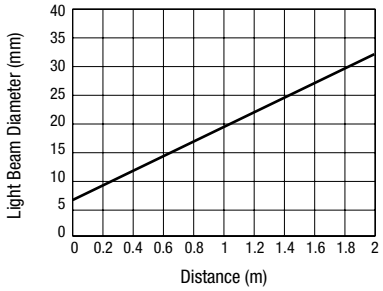
Lateral Displacement



Angle



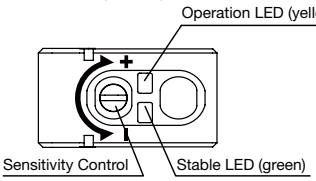
Light Beam Diameter



Operating Instructions

1. Indicator and Output Operation
(except for background suppression model)

• The operation LED turns on (yellow) when the control output is on.



• The stable LED turns on (green) either at stable incident or stable interruption. Make sure to use the photoelectric switch after the stable operation is ensured.

• In the light ON operation, the output turns on when the receiving light intensity level is 1.0 or over as shown on the right.

• In the dark-ON operation, the output turns on when the receiving light intensity level is 1.0 or less as shown on the right.

Receiving Light Intensity Level		Light Receiving Status	Stable LED (green)	Operation LED (yellow)/Control Output	
				Light ON	Dark ON
Operation Level	1.2 and over	Stable Incident	ON	ON	OFF
	1.0	Unstable Incident	OFF		
		Unstable Interruption		OFF	ON
	0.8 and below	Stable Interruption	ON		

2. Optical Axis Alignment (Light ON)

Through-beam

Fasten the receiver temporarily. Place the projector to face the receiver. Move the projector up, down, right and left to find the range where the operation LED turns on. Fasten the projector in the middle of the range. Next, move the receiver up, down, right and left in the same manner and fasten in the middle of the range where the operation LED turns on. Make sure that stable LED turns on at stable incident and stable interruption.

Polarized retro-reflective

Install the reflector perpendicularly to the optical axis. Move the SA1E photoelectric switch up, down, right and left to find the range where the operation LED turns on. Fasten the switch in the middle of the range. Polarized retro-reflective model can be installed also 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. Make sure that stable LED turns on at stable incident and stable interruption.

Diffuse-reflective/Small-beam reflective

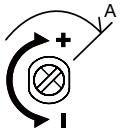
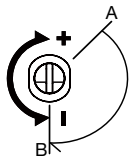
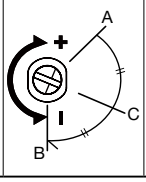
Place the SA1E photoelectric switch where the switch can detect the object. Move the switch up, down, right and left to find the range where the operation LED tuns on. Fasten the switch in the middle of the range. Make sure that stable LED turns on at stable incident and stable interruption. Because the light source element of small-beam reflective model is a red LED, visual inspection is possible as well.

3. Sensitivity Adjustment

Referring to the table at right, adjust the sensitivity of the SA1E photoelectric switch when necessary, in such cases as the through-beam model is used to detect small or translucent objects or the reflective model is affected by background. The table explains the status of operation LED when the operation mode is set to light ON.

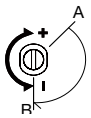
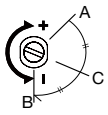
• After adjusting the sensitivity, make sure that stable LED turns on at stable incident and stable interruption. For detecting objects too small to turn on the stable LED, use an optional slit.

• Sensitivity is set to the maximum (+) at the factory before shipment. When adjusting the sensitivity, use the screwdriver supplied with the SA1E photoelectric switch to turn the control as shown below, to a torque of 0.05 N·m maximum.

Step	Photoelectric Switch Status	Sensitivity Control	Adjusting Procedure
1	**Receiving light** • Through-beam, polarized reflective: No object detected • Diffuse reflective, small-beam reflective: Object detected		Turn the control counter-clockwise to the minimum (–). Then turn clockwise (toward +) until the operation LED turns on (turns off with dark ON type) (point A).
2	**Light is interrupted** • Through-beam, polarized reflective: Object detected • Diffuse reflective, small-beam reflective: No object detected		At interruption status, turn the control clockwise (toward +) 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	—		Set the middle point between point A and B as point C.

4. Adjustment of Sensing Range for Background Suppression (BGS) Model

• When adjusting the sensing range, follow the instruction below.

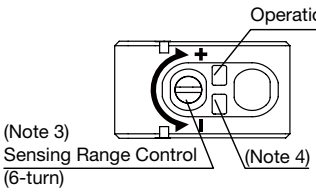
Step	Distance Control	Adjusting Procedure
1		Install the photoelectric switch and the object firmly. Turn the control counterclockwise until the operation LED turns off (turns on with dark ON type). From this point, turn the control clockwise until the operation LED turns on (turns off with dark ON type) (point A).
2		Remove the object, and confirm that the operation LED turns off (turns on with dark ON type). Turn the control clockwise until the operation LED turns on (detecting the background) (turns off with dark ON type) (point B). (Note 1)
3		Set the middle point between point A and B as point C. (Note 2)

Note 1: When the background is far off and not detected, turn the control 360°, and set the point as point C.

Note 2: Because the control is multi-turn, it may take more than one turn to move from point A to point B.

Note 3: Turning the control clockwise lengthens the sensing distance.

Note 4: Background suppression (BGS) model is not provided with a stable LED.



Operating Instructions

5. Power Supply and Wiring

- Do not use the SA1E photoelectric switch at the transient status immediately after turning on the power (approx. 100 ms, background suppression model: 200 ms). When the load and switch use different power supplies, make sure to power up the switch first.
- Use a power supply with little noise and inrush current, and use the photoelectric switch within the rated voltage range. Make sure that 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 FG (frame ground) terminal, otherwise high-frequency noise may affect the photoelectric switch.
- Turn power off before inserting/removing the connector on photoelectric switch. Make sure that excessive mechanical force is not applied to the connector. Connect the connector cable to a tightening torque of 0.5 N·m maximum.
- To ensure the degree of protection, use the applicable connector cable for the connector model. 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 of 0.3 mm^2 minimum core wires, then the cable can be extended up to 100m.

6. Installation

Installing the Photoelectric Switch

- Do not install the SA1E photoelectric switches in an area where the switches are subject to the following conditions, otherwise malfunction and damage may be caused.
  - ∗ Inductive devices or heat source
  - ∗ Extreme vibration or shock
  - ∗ Large amount of dust
  - ∗ Toxic gases
  - ∗ Water, oil, chemicals
  - ∗ Outdoor
- Make sure to prevent sunlight, fluorescent light, and especially the fluorescent light of inverters from entering the receiver of the photoelectric switch directly. Keep the through-beam model receiver away from intense extraneous light.
- Interference prevention allows two SA1E switches to be mounted in close proximity. However, the through-beam model is not equipped with interference prevention. Maintain appropriate distance between the switches referring to the lateral displacement characteristics.
- Because the SA1E photoelectric switches are IP67 waterproof, the SA1E can be exposed to water. However, wipe water drops and smears from the lens and slit using a soft cloth to make sure of the best detecting performance.
- Polycarbonate or acrylic resins are used for optical elements. Do not use ammonia or caustic soda for cleaning, otherwise optical elements will be dissolved. To remove dust and moisture build-up, use soft dry cloth.
- Tighten the mounting screws (M3) to a torque of 0.5 N·m. Do not tighten the mounting screws excessively or hit the switch with a hammer, otherwise the protection degree cannot be maintained.

Installing the Reflector

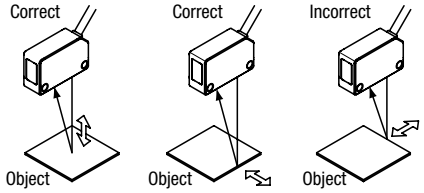
- Use M4 mounting screws for the IAC-R5 and IAC-R8 reflector, and M3 mounting screws for the IAC-R6 reflector. Tighten the mounting screws to a tightening torque of 0.5 N·m maximum. Mounting screws are not supplied with the switch.
- Use the M3 self-tapping screw, flat washer, and spring washer to tighten the IAC-R7 reflector to a torque of 0.5 to 0.6 N·m.
- Optional reflector mounting bracket IAC-L2 is not supplied with mounting screws or nuts.
- IAC-L3 and IAC-L5 are supplied with mounting screws for mounting the reflector on the bracket.
- Reflector IAC-RS1 and IAC-RS2 can be installed directly on a flat surface using the adhesive tape attached to the back of the reflector. Before attaching the reflector, clean the board surface to ensure secure attachment.

Installing the air blower mounting block SA9Z-A02

- When installing the SA9Z-A02 on the SA1E photoelectric switch, use the attached M3 × 20 mounting screws and tighten to a torque of 0.5 N·m maximum.
- Do not use the mounting screw (M3 × 12) supplied with the mounting bracket (SA9Z-K01) to mount the SA1E photoelectric switches.
- The SA9Z-A02 cannot be used with the through-beam slits (SA9Z-S06 to S14).
- The air tube fitting (M5) can be installed to either the top or side. The air tube is not supplied.
- Close the unused port using the air supply port plugging screw and gasket (supplied with SA1E) to a tightening torque of 1 to 2 N·m maximum. The recommended air pressure is 0.1 to 0.3 MPa.

Installing the background suppression (BGS) model

- This sensor can detect objects correctly when the sensor head is installed perpendicular to the moving object. Install the sensor head as shown below to minimize sensing errors.



- If the sensor is used in a place subject to a 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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