

SA1E

**Miniature Photoelectric Switches
(Built-in Amplifier Type)**



IDEC IZUMI CORPORATION

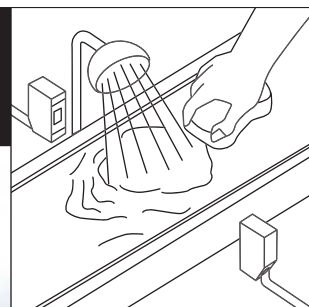
SA1E

Miniature
Photoelectric
Switches

A wide variety for material

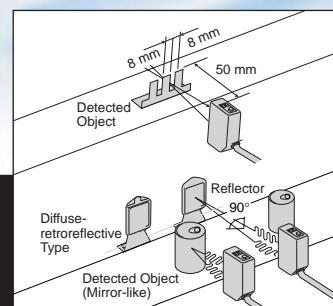
1

Applicable
for Hosedown
Requirements



3

Wide
Variety



NEW!

Red LED Type for easy adjustment to optical axis (through-beam type)



NEW!

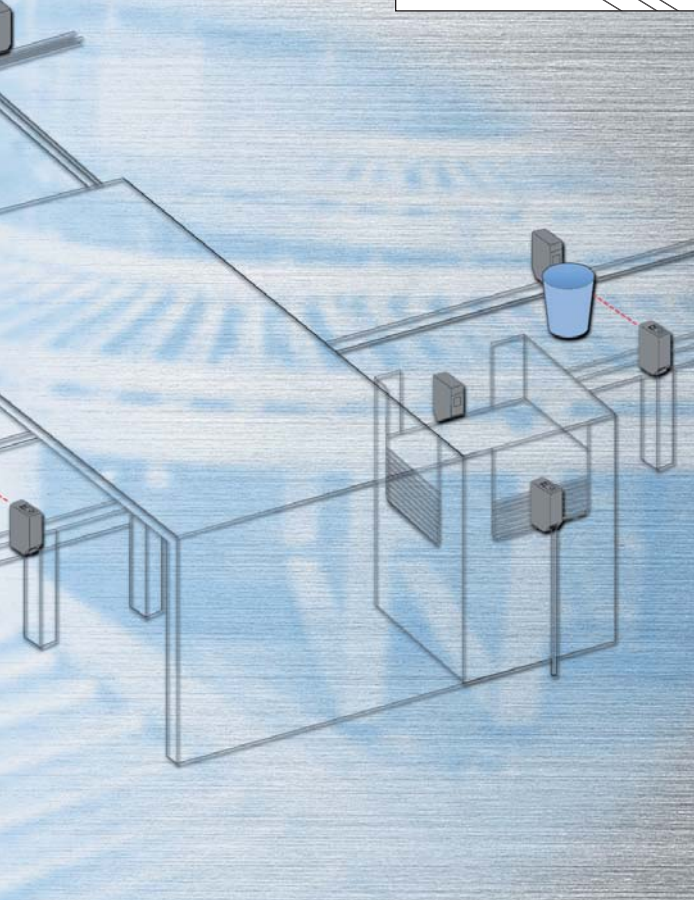
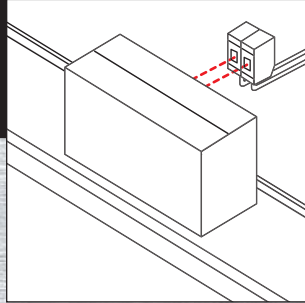
Available without sensitivity adjustment for easy set-up (through-beam, polarized retro-reflective types only)



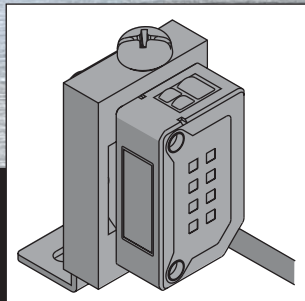
of global advantages handling and manufacturing!



2 Excellent Interference Prevention



4 Accessories



NEW!

Air blower mounting block to install an air blower for cleaning the detection surface



1 Hosedown, IP67 protection

The waterproof, integral molding structure is ideal for food processing and other applications that require frequent water hosedowns. The mounting brackets are made of rust-free stainless steel.

2 Excellent interference prevention

Because two switches can be mounted closely (except for the through-beam type), moving direction of objects can be detected within a narrow space. Outputs from two sensors can be ANDed easily.

3 Simple design, wide variety

- The choice of light ON or dark ON models prevent operation mistakes
- Available in NPN and PNP outputs
- Units without sensitivity adjustment control available (through-beam type, polarized retroreflective type)
- Red LED type available for easy adjustment of optical axis for long-distance detection (through-beam type)

Two connection types

Cable type: 1, 2, and 5 m

Connector type: Straight and right angle (2- or 5-m cable)

Available in four sensing methods

Through-beam type:

Ideal for long distance detection (with sensitivity adjustment: 10 m, without sensitivity adjustment: 15 m)

Diffuse-reflective type (sensing range: 700 mm with white mat paper): Can detect light-reflecting transparent objects

Polarized retroreflective type (sensing range: 2.5 mm): Mirror-like objects can also be detected.

Small-beam reflective type:

Ideal for detecting small objects with easy recognition of red LED beam (50 to 150 mm)

4 Accessories

Slit for through-beam type

A total of 9 types in 3 slit shapes and 3 slit sizes

Reflector for polarized retroreflective type

7 types in 5 styles. Standard, large, small, narrow-shaped, and tape types are available. Narrow-shaped reflectors do not have unnecessary mounting holes, preventing dust build-up. The mounting hole layout of narrow-shaped side mounting types are same with SA1E switches.

Mounting bracket

Vertical, horizontal, and protective cover types are available. Protective cover type is used for protecting the sensor from operators and equipment.


Air blower mounting block

Used for installing an air blower to clean the detection surface. Ideal to maintain a clean detection surface and sensor performance.



SA1E Miniature Photoelectric Switches











Simple, small design for world-wide usage.

- Four sensing methods
- Cable type and M8 connector type are available.
- NPN output, PNP output, light ON, dark ON can be selected.
- Red LED type available for easy optical axis adjustment of long distance applications (through-beam type, polarized retroreflective type, small-beam reflective type)
- Units without sensitivity adjustment (through-beam, polarized retroreflective types)
- Air blower mounting block for installing an air blower on the detection surface. Ideal to maintain a clean detection surface and sensor performance.
- CE marked 



Types

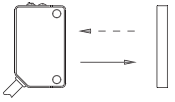
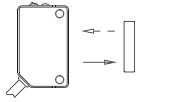
• Photoelectric Switches

Sensing Method			Sensing Range	Connection	Cable Length	Operation Mode	Type No.	
							NPN Output	PNP Output
Through-beam Type	Infrared LED	w/Sensitivity Adjustment		Cable	1 m	Light ON	SA1E-TN1	SA1E-TP1
						Dark ON	SA1E-TN2	SA1E-TP2
					2 m	Light ON	SA1E-TN1-2M	SA1E-TP1-2M
		w/o Sensitivity Adjustment		Cable		Dark ON	SA1E-TN2-2M	SA1E-TP2-2M
					5 m	Light ON	SA1E-TN1-5M	SA1E-TP1-5M
						Dark ON	SA1E-TN2-5M	SA1E-TP2-5M
	Red LED	w/Sensitivity Adjustment		Connector	—	Light ON	SA1E-TN1C	SA1E-TP1C
						Dark ON	SA1E-TN2C	SA1E-TP2C
		w/o Sensitivity Adjustment		Cable	1 m	Light ON	SA1E-TN1-NA	SA1E-TP1-NA
						Dark ON	SA1E-TN2-NA	SA1E-TP2-NA
					2 m	Light ON	SA1E-TN1-NA-2M	SA1E-TP1-NA-2M
						Dark ON	SA1E-TN2-NA-2M	SA1E-TP2-NA-2M
Polarized Retroreflective Type	Red LED	w/Sensitivity Adjustment		Cable	1 m	Light ON	SA1E-PN1	SA1E-PP1
						Dark ON	SA1E-PN2	SA1E-PP2
					2 m	Light ON	SA1E-PN1-2M	SA1E-PP1-2M
		w/o Sensitivity Adjustment		Cable		Dark ON	SA1E-PN2-2M	SA1E-PP2-2M
					5 m	Light ON	SA1E-PN1-5M	SA1E-PP1-5M
						Dark ON	SA1E-PN2-5M	SA1E-PP2-5M
		w/Sensitivity Adjustment		Connector	—	Light ON	SA1E-PN1C	SA1E-PP1C
						Dark ON	SA1E-PN2C	SA1E-PP2C
	Red LED	w/Sensitivity Adjustment		Cable	1 m	Light ON	SA1E-PN1-NA	SA1E-PP1-NA
						Dark ON	SA1E-PN2-NA	SA1E-PP2-NA
					2 m	Light ON	SA1E-PN1-NA-2M	SA1E-PP1-NA-2M
		w/o Sensitivity Adjustment		Cable		Dark ON	SA1E-PN2-NA-2M	SA1E-PP2-NA-2M
					5 m	Light ON	SA1E-PN1-NA-5M	SA1E-PP1-NA-5M
						Dark ON	SA1E-PN2-NA-5M	SA1E-PP2-NA-5M
		w/Sensitivity Adjustment		Connector	—	Light ON	SA1E-PN1C-NA	SA1E-PP1C-NA
						Dark ON	SA1E-PN2C-NA	SA1E-PP2C-NA

SA1E Miniature Photoelectric Switches

Types

• Photoelectric Switches

Sensing Method			Sensing Range	Connection	Cable Length	Operation Mode	Type No.	
							NPN Output	PNP Output
Diffuse-reflective Type	Infrared LED	w/Sensitivity Adjustment	 700 mm See the characteristics on page 13.	Cable	1 m	Light ON	SA1E-DN1	SA1E-DP1
						Dark ON	SA1E-DN2	SA1E-DP2
					2 m	Light ON	SA1E-DN1-2M	SA1E-DP1-2M
						Dark ON	SA1E-DN2-2M	SA1E-DP2-2M
					5 m	Light ON	SA1E-DN1-5M	SA1E-DP1-5M
						Dark ON	SA1E-DN2-5M	SA1E-DP2-5M
Small-beam Reflective Type	Red LED	w/Sensitivity Adjustment	 50 to 150 mm See the characteristics on page 13.	Cable	1 m	Light ON	SA1E-NN1	SA1E-NP1
						Dark ON	SA1E-NN2	SA1E-NP2
					2 m	Light ON	SA1E-NN1-2M	SA1E-NP1-2M
						Dark ON	SA1E-NN2-2M	SA1E-NP2-2M
					5 m	Light ON	SA1E-NN1-5M	SA1E-NP1-5M
						Dark ON	SA1E-NN2-5M	SA1E-NP2-5M
				Connector	—	Light ON	SA1E-DN1C	SA1E-DP1C
						Dark ON	SA1E-DN2C	SA1E-DP2C
						Light ON	SA1E-NN1C	SA1E-NP1C
						Dark ON	SA1E-NN2C	SA1E-NP2C

Note: Maintain at least 100 mm clearance between the SA1E photoelectric switch and reflector. Reflectors are not provided with the photoelectric switch and must be ordered separately.

Accessories (optional)

• Slits (for through-beam type)

Item	Slit Size	Type No.	Ordering Type 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	

• Mounting Brackets

Item		Type No.	Package Quantity
Mounting Bracket	Vertical Mounting	SA9Z-K01	1
	Horizontal Mounting	SA9Z-K02	
	Cover type	SA9Z-K03	

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

• Air Blower Mounting Block

Item	Type No.	Package Quantity
Air Blower Mounting Block	SA9Z-A02	1

- 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 attached.
- The air tube fitting and mounting bracket are not attached and must be ordered separately (recommended mounting bracket: SA9Z-K01).
- Material: Anodized aluminum surface

• Reflectors (for polarized retroreflective type)

Item		Type 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	IAC-RS1	
Reflector Mounting Bracket	For IAC-R5	IAC-L2	
	For IAC-R6	IAC-L3	
	For IAC-R8	IAC-L5	

- 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 screw).
- The IAC-L5 is supplied with two mounting screws (M4 × 10 mm sems screw).
- 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 a M3 × 8 mm self-tapping screw, a flat washer, and a spring washer.

• Connector Cable (for connector type)

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

SA1E Miniature Photoelectric Switches

Specifications

Sensing Method		Through-beam Type	Polarized Retroreflective Type	Diffuse-reflective Type	Small-beam Reflective Type
Type No.		SA1E-T	SA1E-P	SA1E-D	SA1E-N
Power Voltage		12 to 24V DC (Operating range: 10 to 30V DC) Equipped with reverse-polarity protection			
Power Consumption		Projector: 15 mA Receiver: 20 mA	30 mA		
Sensing Range		10 m (with sensitivity adjustment) 15 m (without sensitivity adjustment)	2.5 m (IAC-R5/R8) 1.5 m (IAC-R6) (Note 1) 1.0 m (IAC-RS1) 0.8 m (IAC-R7)	700 mm (using 200 × 200 mm white mat paper)	50 to 150 mm (using 100 × 100 mm white mat paper)
Detectable Object		Opaque		Opaque/Transparent	
Hysteresis		—		20% maximum	
Response Time		1 ms maximum			
Sensitivity Adjustment		Adjustable using a potentiometer (approx. 260°) Through-beam type and polarized retroreflective type are also available without sensitivity adjustment.			
Light Source Element		Infrared LED/Red LED	Red LED	Infrared LED	Red LED
Operation Mode		Light ON/Dark ON			
Control Output		NPN open collector or PNP open collector 30V DC, 100 mA maximum Voltage drop: 1.2V maximum Short-circuit protection			
LED Indicators		Operation LED: Yellow Stable LED: Green Power LED: Green (Through-beam type projector)			
Interference Prevention		—	Two units can be mounted closely.		
Degree of Protection		IP67 (IEC60529)			
Extraneous Light Immunity		Sunlight: 10,000 lux maximum, Incandescent lamp: 3,000 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 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: PC/PBT, Lens: PC (Polarized retroreflective type: PMMA), Indicator cover: PC			
Attachments		Instruction sheet, Sensitivity control screwdriver			
Weight (approx.)	Cable Type (Note 2)	Projector: 30 g Receiver: 30 g	30 g		
	Connector Type	Projector: 10 g Receiver: 10 g	10 g		
Connection Method	Cable Type	ø3.5 mm, 3-core, 0.2 mm ² , 1-m vinyl cabtyre cable (2-core for the projector of through-beam type)			
	Connector Type	M8 connector (4-pin)			

Note 1: Maintain at least 100 mm clearance between the SA1E photoelectric switch and reflector.

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

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.

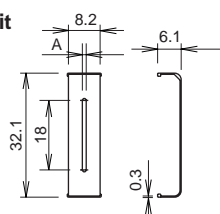
Slit		w/Sensitivity Adjustment				w/o Sensitivity Adjustment			
		Sensing Range (m)		Minimum Detectable Object Width (mm)		Sensing Range (m)		Minimum Detectable Object Width (mm)	
Type No.	Slit Width: A	Used on one side	Used on both sides	Used on one side	Used on both sides	Used on one side	Used on both sides	Used on one side	Used on both sides
SA9Z-S06	0.5 mm	2.5	1.0	7.0	0.5	5.0	1.5	7.0	0.5
SA9Z-S07	1.0 mm	3.5	1.5	7.0	1.0	7.0	3.0	7.0	1.0
SA9Z-S08	2.0 mm	6.0	3.5	7.0	2.0	9.0	5.5	7.0	2.0
SA9Z-S09	0.5 mm	2.0	0.7	7.0	0.4	4.0	1.5	7.0	0.5
SA9Z-S10	1.0 mm	3.0	1.5	7.0	0.7	7.0	2.5	7.0	0.8
SA9Z-S11	2.0 mm	5.5	3.0	7.0	1.5	9.0	5.0	7.0	1.5
SA9Z-S12	0.5 mm	0.8	0.08	5.0	0.3	1.3	0.1	5.0	0.5
SA9Z-S13	1.0 mm	1.5	0.3	5.0	0.6	2.5	0.3	5.0	0.6
SA9Z-S14	2.0 mm	2.5	1.2	5.0	1.5	5.5	1.6	5.0	1.7

Used on one side: Slit is attached to the receiver only.

Dimensions

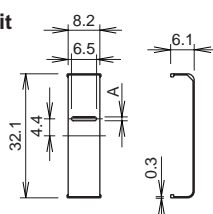
• Vertical Slit

SA9Z-S06
SA9Z-S07
SA9Z-S08



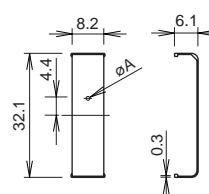
• Horizontal Slit

SA9Z-S09
SA9Z-S10
SA9Z-S11



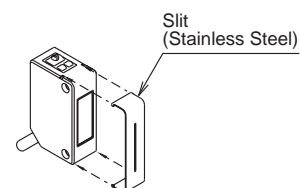
• Round Slit

SA9Z-S12
SA9Z-S13
SA9Z-S14



All dimensions are in mm.

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

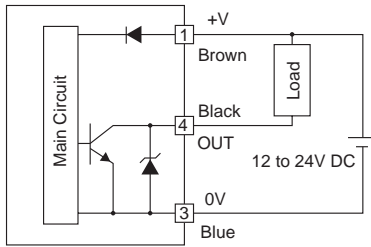


Horizontal slits and round slits have an orientation. Make sure that the TOP marking comes on top of the sensor (LED side).

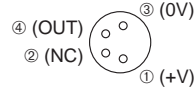
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Output Circuit & Wiring Diagram

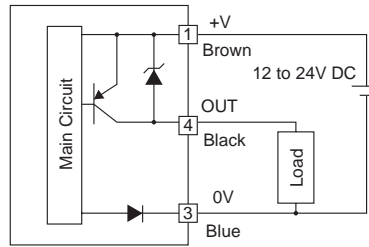
• NPN Output



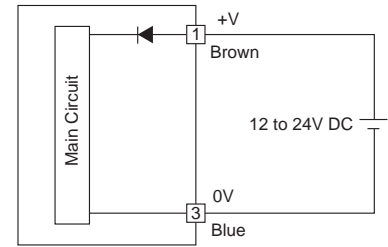
(Connector Pin Assignment)



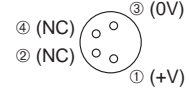
• PNP Output



• Through-beam Type projector



(Connector Pin Assignment)



Dimensions

• Cable Type

Through-beam

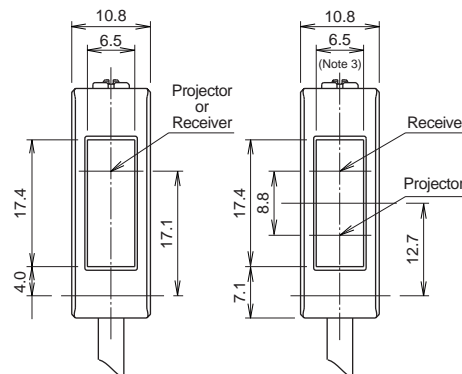
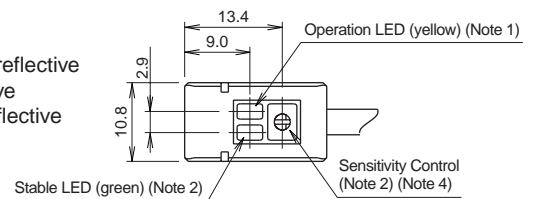


Polarized retroreflective
Diffuse-reflective
Small-beam reflective



• Through-beam

- Polarized retroreflective
- Diffuse-reflective
- Small-beam reflective



Note 1: Power ON LED (green) for through-beam projector

Note 2: No sensitivity control and stable LED are attached on the through-beam projector.

Note 3: 5.2 mm for polarized retroreflective type

Note 4: No sensitivity control is installed on the type without sensitivity adjustment.

Note 5: Cable length depends on types.

• Connector Type

Through-beam

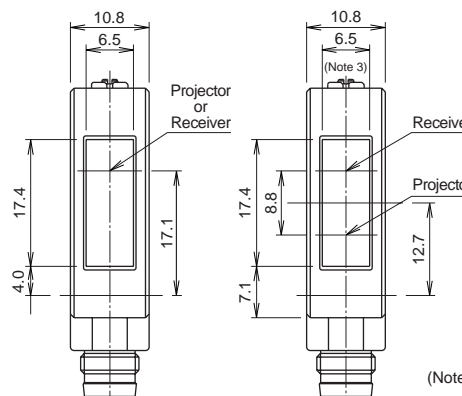
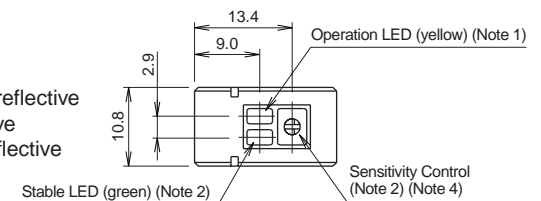


Polarized retroreflective
Diffuse-reflective
Small-beam reflective



• Through-beam

- Polarized retroreflective
- Diffuse-reflective
- Small-beam reflective



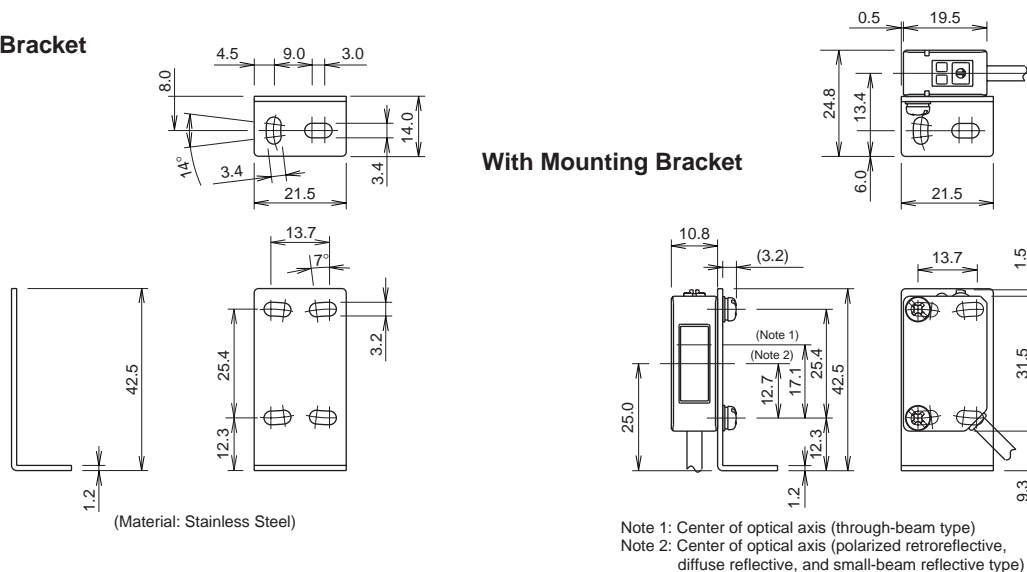
Note 6: The connector length is 18 mm when a connector cable of right angle type (SA9Z-CM8K-4L*) is attached.

All dimensions in mm.

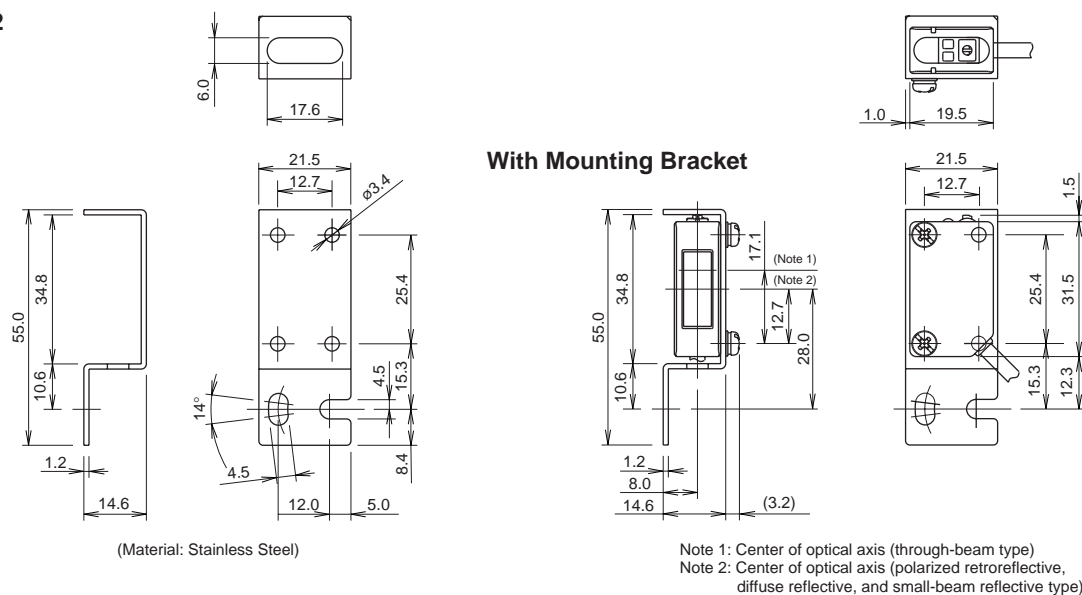
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Dimensions

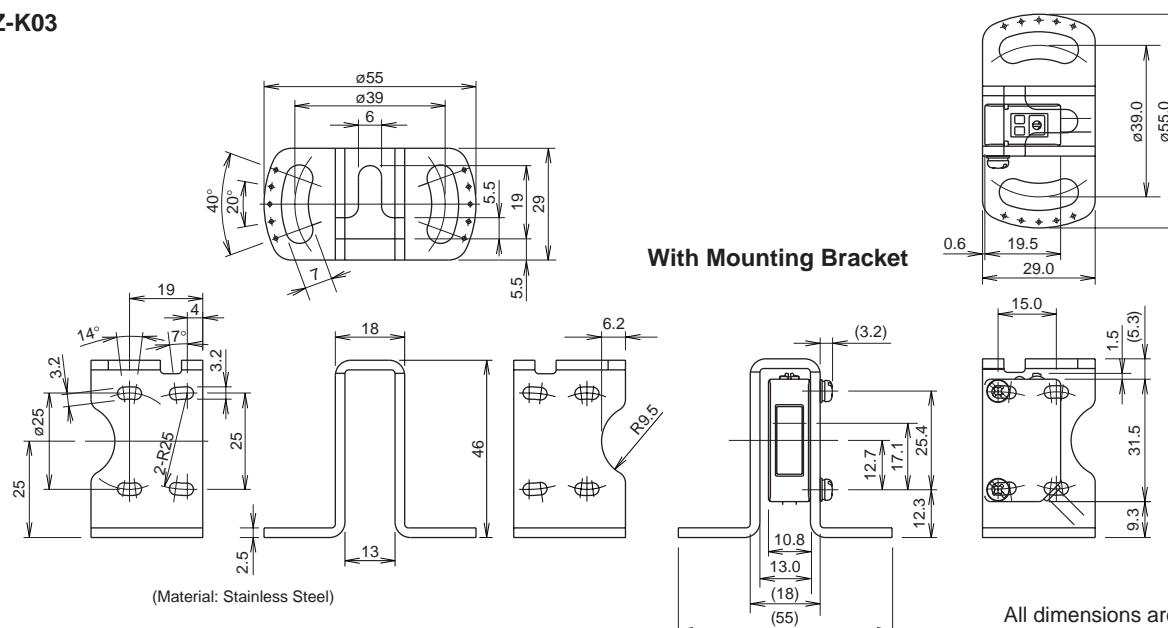
• Mounting Bracket SA9Z-K01



SA9Z-K02



SA9Z-K03

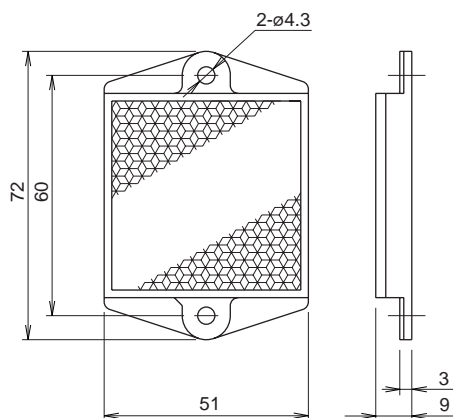


All dimensions are in mm.

SA1E Miniature Photoelectric Switches

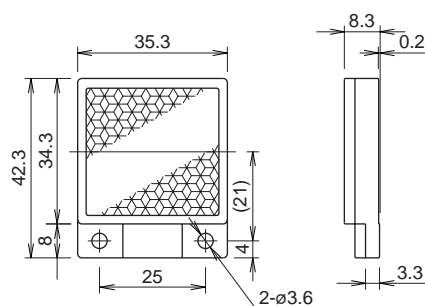
• Reflector

IAC-R5



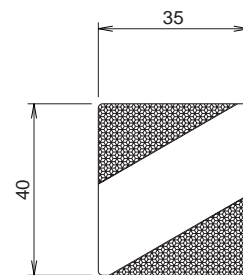
(Effective reflecting area: 47.2×47.2)

IAC-R6

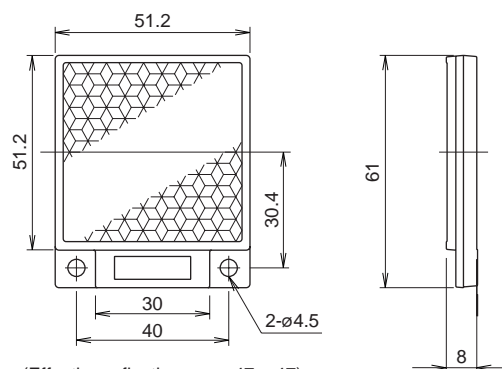


(Effective reflecting area: 30×31)

IAC-RS1

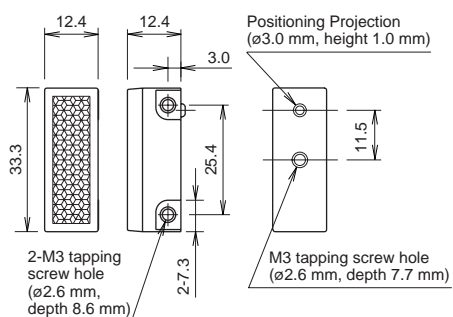


IAC-R8

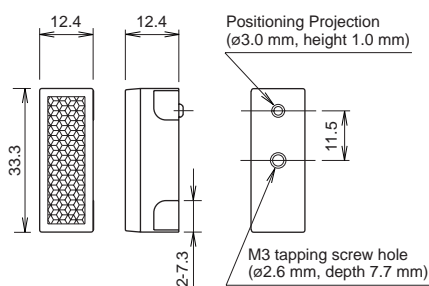


(Effective reflecting area: 47×47)

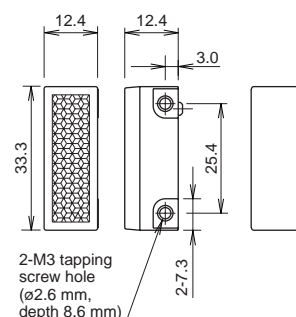
IAC-R7M (rear/side mounting)



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.

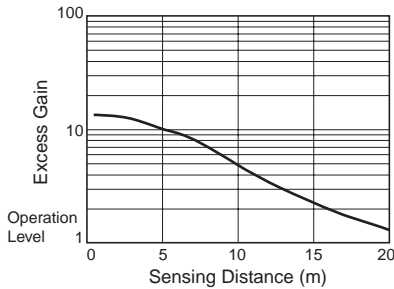
All dimensions are in mm.

SA1E Miniature Photoelectric Switches

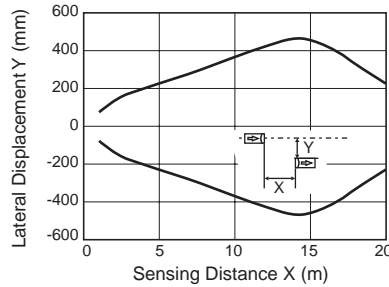
Characteristics (Typical)

1. Through-beam Type SA1E-T (Infrared LED w/sensitivity adjustment) SA1E-TA (Red LED w/sensitivity adjustment)

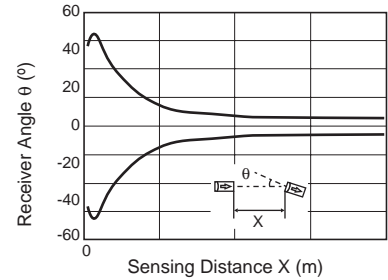
• Excess Gain (Without slit)



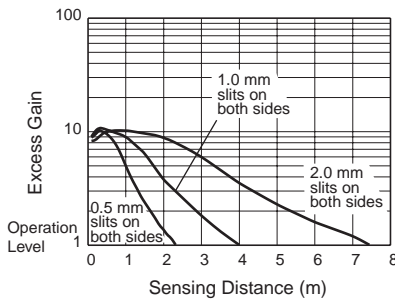
• Lateral Displacement (Without slit)



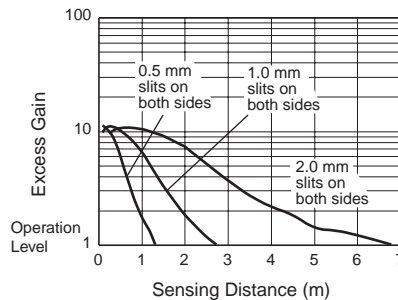
• Angle (Without slit)



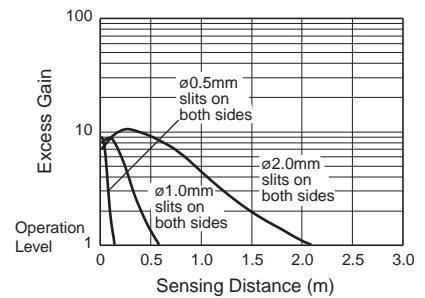
• Excess Gain (With vertical slit)



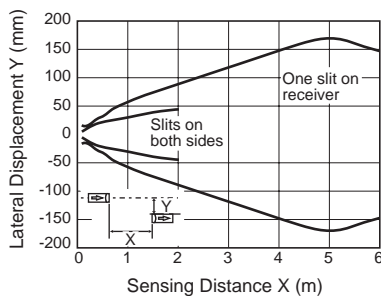
• Excess Gain (With horizontal slit)



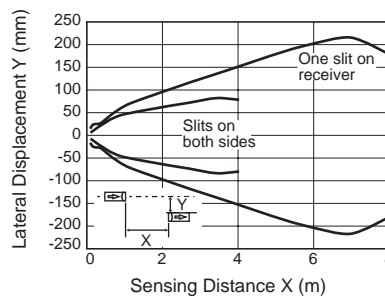
• Excess Gain (With round slit)



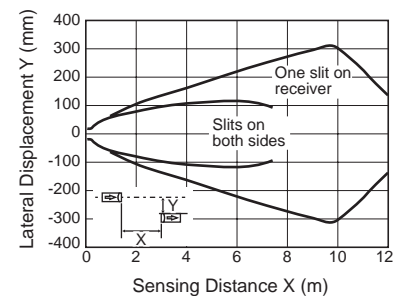
• Lateral Displacement (With 0.5-mm vertical slit)



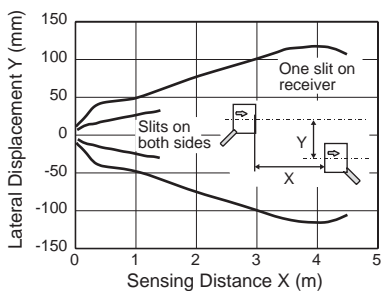
• Lateral Displacement (With 1.0-mm vertical slit)



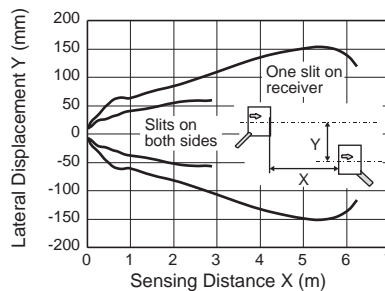
• Lateral Displacement (With 2.0-mm vertical slit)



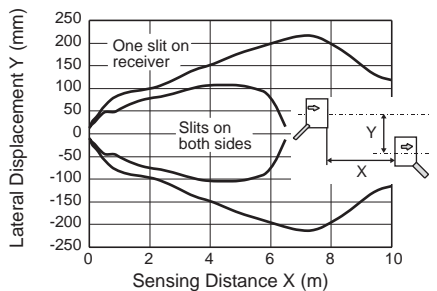
• Lateral Displacement (With 0.5-mm horizontal slit)



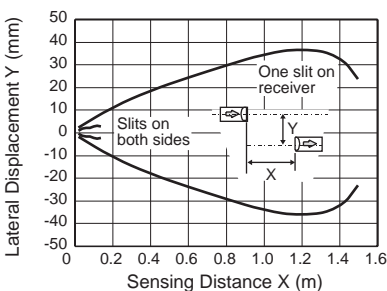
• Lateral Displacement (With 1.0-mm horizontal slit)



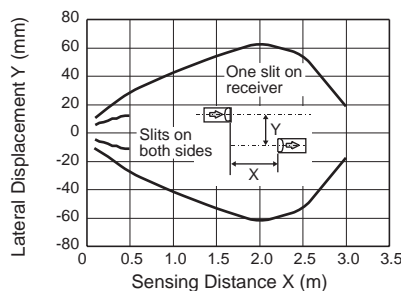
• Lateral Displacement (With 2.0-mm horizontal slit)



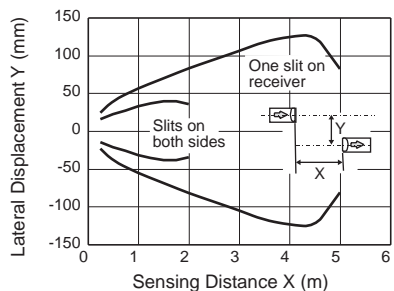
• Lateral Displacement (With ø0.5-mm round slit)



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



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

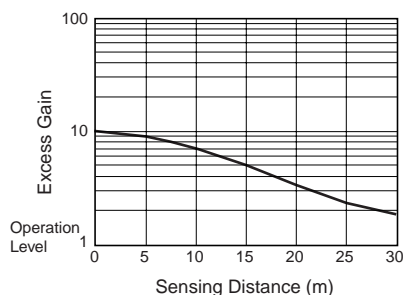


SA1E Miniature Photoelectric Switches

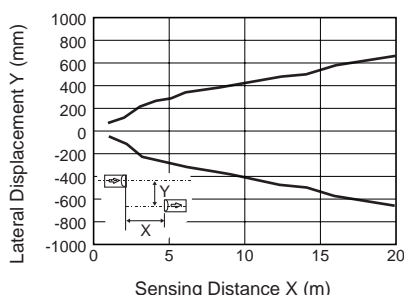
Characteristics (Typical)

2. Through-beam Type SA1E-T*NA (Infrared LED w/o sensitivity adjustment)

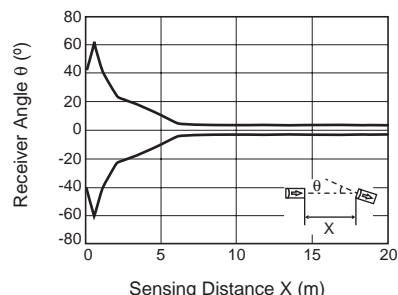
• Excess Gain (Without slit)



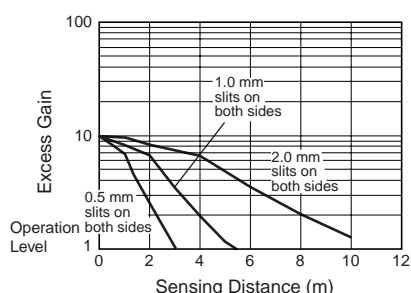
• Lateral Displacement (Without slit)



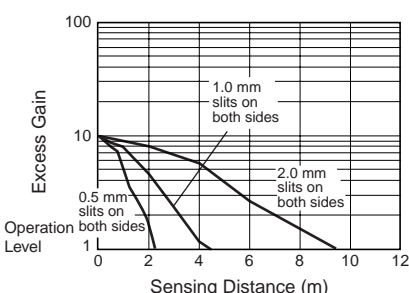
• Angle (Without slit)



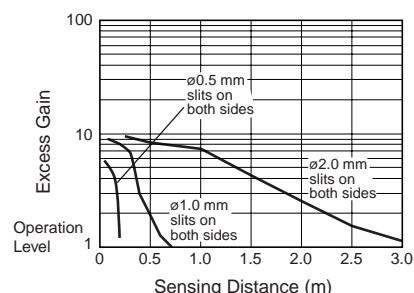
• Excess Gain (With vertical slit)



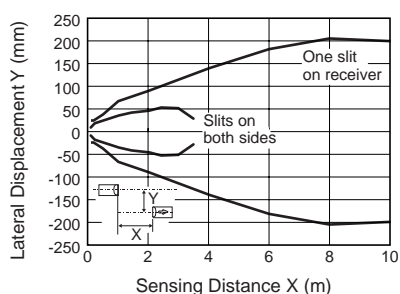
• Excess Gain (With horizontal slit)



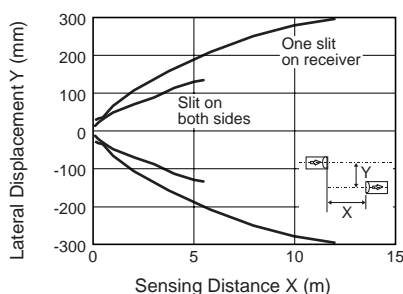
• Excess Gain (With round slit)



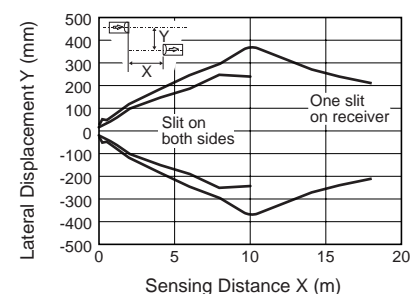
• Lateral Displacement (With 0.5-mm vertical slit)



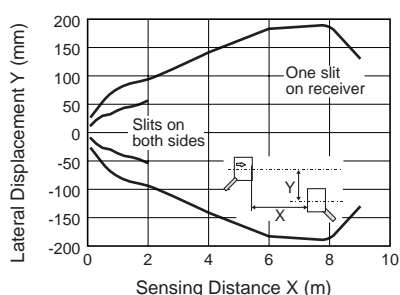
• Lateral Displacement (With 1.0-mm vertical slit)



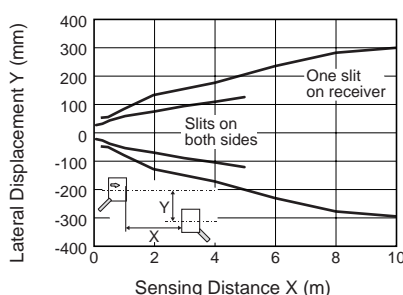
• Lateral Displacement (With 2.0-mm vertical slit)



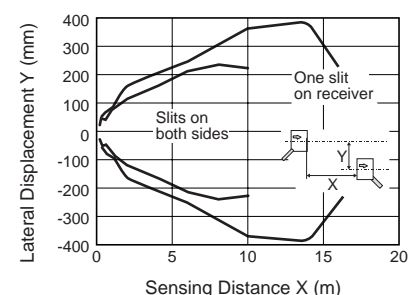
• Lateral Displacement (With 0.5-mm horizontal slit)



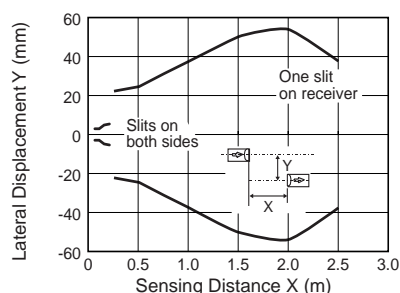
• Lateral Displacement (With 1.0-mm horizontal slit)



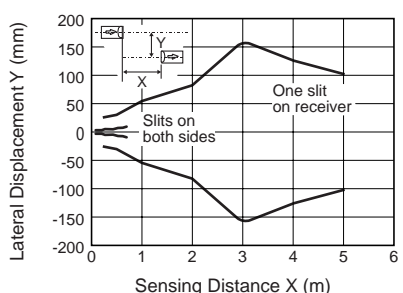
• Lateral Displacement (With 2.0-mm horizontal slit)



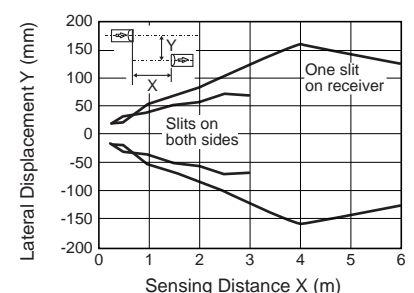
• Lateral Displacement (With ø0.5-mm round slit)



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



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



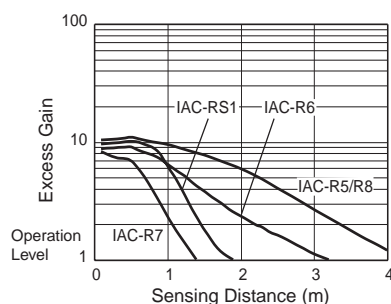
SA1E Miniature Photoelectric Switches

Characteristics (Typical)

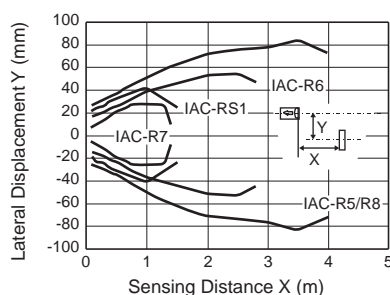
3. Polarized Retroreflective Type SA1E-P (Red LED w/sensitivity adjustment)

SA1E-P*-NA (Red LED w/o sensitivity adjustment)

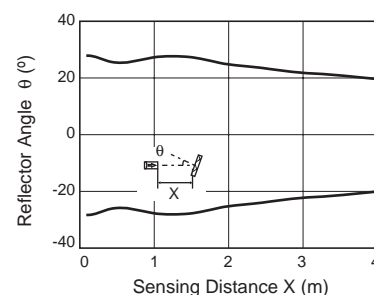
• Excess Gain



• Lateral Displacement

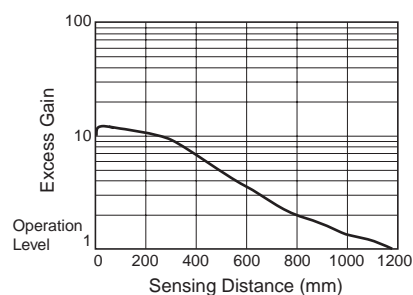


• Angle (when using IAC-R5/-R8)

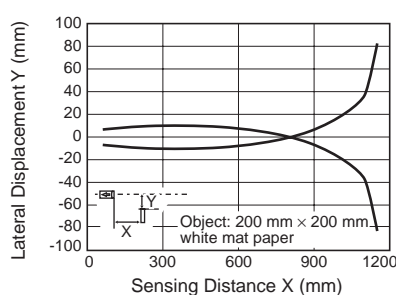


4. Diffuse-Reflective Type SA1E-D (Infrared LED w/sensitivity adjustment)

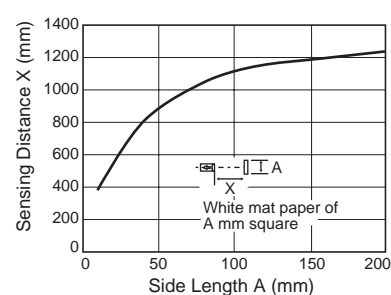
• Excess Gain



• Sensing Area

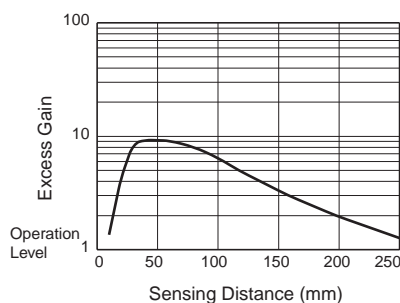


• Object Size vs Sensing Distance

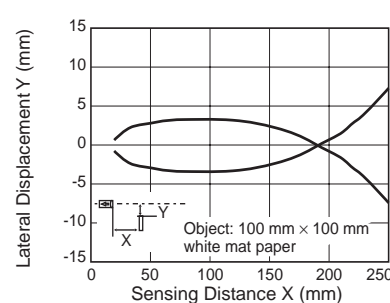


5. Small-beam Reflective Type SA1E-N (Red LED sensitivity adjustment)

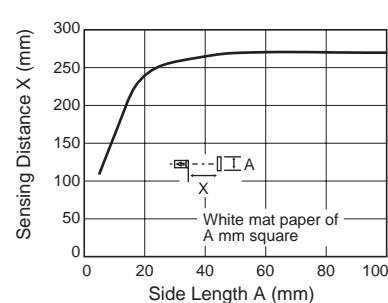
• Excess Gain



• Sensing Area



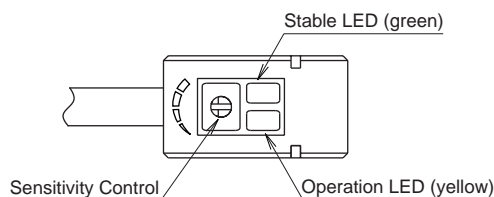
• Object Size vs Sensing Distance



SA1E Miniature Photoelectric Switches

Instructions

1. Indicator and Output Operation



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

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

2. Optical Axis Alignment (Light ON)

• Through-beam type

Fasten the receiver temporarily. Placing 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 retroreflective type

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 retroreflective type 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 type/Small-beam reflective type

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 turns 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 type is a red LED, visual inspection is possible as well.

3. Sensitivity Adjustment

- Referring to the table below, adjust the sensitivity of the SA1E photoelectric switch when necessary, in such cases as the through-beam type is used to detect small or translucent objects or the reflective type 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 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 <ul style="list-style-type: none"> • Through-beam type, polarized reflective type: No object detected • Diffuse reflective type, small-beam reflective type: Object detected 		Turn the control counter-clockwise to the minimum. Then turn clockwise until the operation LED turns on (turns off with dark ON type) (point A).
2	Not receiving light <ul style="list-style-type: none"> • Through-beam type, polarized reflective type: Object detected • Diffuse reflective type, small-beam reflective type: No 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			Set the middle point between point A and B as point C.

4. Power Supply and Wiring

- Do not use the SA1E photoelectric switch at the transient status immediately after turning on the power (approx. 100 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.
- Before wiring, verify the cable color according to the wiring diagram.
- 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. Make sure that excessive mechanical force is not applied to the connector on photoelectric switch. 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 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 of 0.3 mm² minimum core wires, then the cable can be extended up to 100 m.

SA1E Miniature Photoelectric Switches

5. Installation

- 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 machinery or heat source nearby
 - * 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 type receiver away from intense extraneous light.
- Interference prevention allows two SA1E switches to be mounted closely. However, the through-beam type switch is not equipped with interference prevention. Maintain appropriate clearance between the switches referring to the lateral displacement characteristics on page 11.
- Because the SA1E photoelectric switches are IP67 waterproof, the SA1E can be exposed to water splashes. 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 cloth dipped in alcohol.
- Make sure to operate the SA1E photoelectric switch in the environment where temperature, vibration, and shock are within the specification values.

Installing the Photoelectric Switch

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

Installing the Reflector

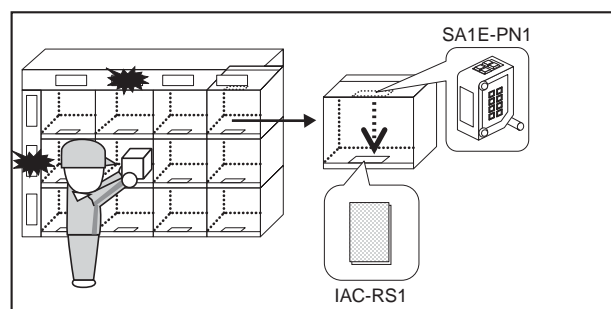
- Use M4 mounting screws for the IAC-R5 reflector and M5 mounting screws for the IAC-R6 reflector. Tighten the mounting screws to a tightening torque of 0.5 N·m maximum. Mounting screws are not supplied with the switch.
- While optional reflector mounting bracket IAC-L2 is not supplied with mounting screws or nuts, the IAC-L3 and IAC-L5 are supplied with mounting screws for mounting the reflector on the bracket.
- Reflector IAC-RS1 can be installed directly on a metal board 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

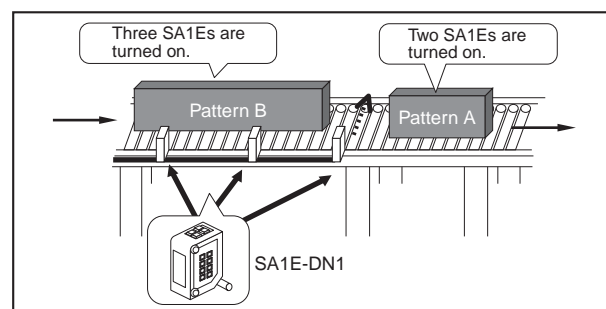
- When installing the SA9Z-A02 on the SA1E photoelectric switch, use the attached M3 × 20 mounting screws and tighten to a torque of 0.5 N·m maximum.
- Do not use the mounting screw (M3 × 12) supplied with the mounting bracket (SA9Z-K01) to mount the SA1E photoelectric switches.
- The SA9Z-K01 mounting bracket is not attached to the SA9Z-A02 and must be ordered separately.
- 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 attached.
- Close the unused port using the attached air supply port plugging screw and gasket to a tightening torque of 1 to 2 N·m maximum. The recommended air pressure is 0.1 to 0.3 MPa.

Applications

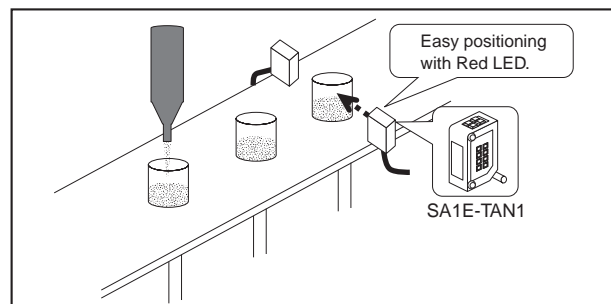
1. For retrieval system of production lines to detect whether correct objects have been retrieved.



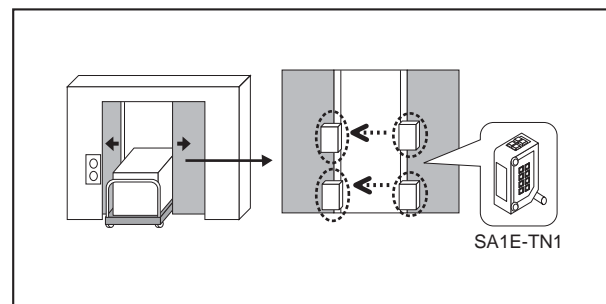
2. For determining objects by length.



3. For checking whether the pre-determined volume of a granular substance has been dispensed.



4. For detecting objects between doors.





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