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IDEC Sensors Selection Guide

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		Series	SA1E	SA1U
Optic Function	Through-beam (SA1E Class 1 Laser models available)		0 - 15m	0 - 50m
	Polarized Retro-reflective (on R2 reflector)		0.05 - 4m	0.2 - 7m
	Diffuse Proximity (SA1E Class 1 Laser models available)		0 - 700mm 50 - 150mm	0 - 1m
	Small-beam reflective		50 - 150mm	-
	Background Suppression (SA1E Class 1 Laser models available)		50 - 250mm	0.2 - 2m
	Convergent		5 - 35mm	-
	Transparent		2m	-
Specifications	Power Supply	V DC	10 - 30	10 - 30
		V AC/V DC		21.6 - 264 V AC 10.8 - 264 V DC
	Output	PNP	√	√
		NPN	√	√
	Connection	cable	√	
		connector	√	
		terminal block		√
	Dimensions		11 x 31 x 19	25 x 67.5 x 90
	Housing Material		PC/PBT	PBT
	Mechanical Protection		IP67	IP67
Approvals				

			Fiber Optic	
				
Optic Function	Diffuse Proximity with Fiber Optic		Page	196
			Series	SA1C-FK
Specifications				0 - 60mm
	Power Supply	V DC	12 - 24	10 - 30
	Output	PNP		√
		NPN	√	√
	Connection	Cable	√	√
		Connector	-	-
	Dimensions (mm)		26 x 72.7 x 13	26 x 72.7 x 13
	Housing Material		PBT	PBT
Mechanical Protection		IP66	IP66	
Approvals				

Datalogic Vision Sensor

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Series	DATAVS1	DATAVS2
Appearance		
Page	visit www.IDEC.com/sensors	
Highlights	<ul style="list-style-type: none"> • Immediate Setup without PC • VSC Configurator with 3.5" LCD display • Completely embedded sensor • Stand-alone functioning • Real time monitoring • Object Recognition tools and OCV 	<ul style="list-style-type: none"> • Versatile PC setup • Wizard-based software • Ethernet communication • Object recognition or identification tools • 360° pattern match • Monitoring and tuning via VSM monitor • Multiple controls • IP discovery function
Tools		
360° Pattern Match		√
Object Recognition (Brightness, Contrast, Width, Position, Contour Match, Pattern Match, Edge Count)	√	√
Barcode and Datamatrix		√
Optical Character Verification	√	√

For more information, visit www.IDEC.com/sensors

Datalogic M18 Tubular Photoelectric

Series	S5	S10	S15	S50	S51	
Appearance						
Page	visit www.IDEC.com/sensors					
Operating Distances	Through-beam	0 - 12m	0 - 18m	0 - 20m	0 - 20m, 0 - 60m class 1 laser	0 - 20m
	Retro-reflective	0.1 - 4m	0.1 - 4m	0.1 - 4m	0.1 - 4m	0.1 - 4m
	Polarized Retro-reflective	0.1 - 3m	0.1 - 3m	0.1 - 3m	0.1 - 4m, 0.1 - 16m class 1 laser	0.1 - 3m
	Transparent	0.1 - 0.8m	0.1 - 0.8m	–	0.1 - 1.3m	–
	Diffuse	1 - 100mm, 1 - 350mm, 0 - 600mm	1 - 100mm, 1 - 350mm, 0 - 600mm	1 - 100mm, 1 - 350mm	0 - 100mm, 0 - 350mm, 0 - 700mm, 0 - 350mm class 1 laser	0 - 100mm
	Fixed focus	15mm	14mm	–	100mm	1 - 450mm
	Background suppression	–	–	–	5 - 100mm	–
	Foreground suppression	–	–	–	4 - 100mm	–
	Distance sensor	–	–	–	5 - 100mm	–
	Through-beam with fiber optic	0 - 85mm	–	–	0 - 100mm	–
Diffuse with fiber optic	0 - 22mm	–	–	0 - 30mm	–	
Technical	Power supply	10 - 30VDC, 15 - 264VAC	10 - 30VDC	12 - 30VDC	10 - 30VDC	10 - 30VDC
	Approximate dimensions (mm)	M18 x 55/68	M18 x 55/67	M18 x 40	M18 x 55/68	M18 x 55/68
	Housing material	ABS	NI plated brass, AISI-316L stainless steel	ABS	PBT, NI plated brass	PBT, NI plated brass
	Mechanical protection	IP67	IP69K	IP69K	IP67	IP67
Highlights	Varied optic functions can be chosen from fixed focus or diffuse proximity models with short, medium or long operating distances. A red LED indicates the output status, while versions with trimmer adjustment present also have a green LED signaling switching stability.	Suitable for applications in the mechanical or food industries, IP69K mechanical protection guarantees resistance to wash down at high temperatures and pressure. AISI-316L stainless steel versions are available for resistance to chemical agents.	A housing length of only 40mm is perfect for applications with reduced space. Available optic functions include: polarized retro-reflective, non-polarized retro-reflective, diffuse proximity and through beam. These sensors are ideal for critical applications with harsh environmental conditions.	With universal sensing functions of proximity, polarized retro-reflective and through beam, as well as more advanced functions of background suppression, background/foreground suppression, analog displacement, contrast and luminescence, the S50 is one housing for all applications.	The S51 series offers a cost-effective solution, with a wide range of operating distances from 10cm fixed operating distance with the diffuse proximity models up to 4m with the standard retro-reflective models. The emitter and receiver models, used for longer operating distances, reach 18 meters.	

Datalogic Miniature and Fiber Optic Photoelectric

Series	SMall	S40	S41	S8	S7	
Appearance						
Page	visit www.IDEC.com/sensors					
Operating Distances	Through-beam	0 - 2m	0.1 - 6m	0.1 - 6m	-	-
	Retro-reflective	50 - 1500mm	0.1 - 3m	-	-	-
	Polarized Retro-reflective	0.1 - 1m	0.1 - 2.5m, 0.1 - 6m class 2 laser	0.1 - 2.5m	0 - 10m class 2 laser, 0.1 - 5m	-
	Transparent	-	0.1 - 0.7m	0.1 - 0.7m	0 - 0.8m	-
	Diffuse	-	50 - 300mm, 40 - 150mm class 2 laser	2 - 350mm	0 - 500mm	-
	Fixed focus	3 - 15mm, 3 - 20mm, 3 - 30mm, 3 - 50mm	15 - 100mm, 20 - 600mm class 2 laser	110mm	-	-
	Background suppression	-	-	-	20 - 200mm class 2 laser, 50 - 300mm	-
	Through-beam with fiber optic	-	-	-	-	0 - 300mm, 0 - 150mm, 0 - 75mm
Technical	Diffuse with fiber optic	-	-	-	-	0 - 100mm, 0 - 50mm, 0 - 25mm
	Power supply	10 - 30VDC	10 - 30VDC	10 - 30VDC	12 - 30VDC	12 - 24VDC
	Approximate dimensions (mm)	8 x 23 x 12	12 x 32 x 20	12 x 32 x 20	14 x 42 x 25	10 x 40 x 65
	Housing material	polycarbonate	ABS	ABS	ABS	ABS
Highlights	Mechanical protection	IP67	IP67	IP67	IP67	IP65
		This subminiature series, suitable for applications with reduced space, offers through beam, retro-reflective polarized and accurate fixed focus proximity models to guarantee precise detection. A red LED emission simplifies installation procedures.	With innovative miniature housing, these sensors offer all the main optic functions with the advantages of microprocessor control and automatic Teach-in, as well as Remote setting with EASYtouch™ procedure.	A basic line of photoelectric sensors in miniature housing, these sensors are ideal for applications that require reduced dimensions and costs.	This series offers excellent detection performances, usually associated with sensors that have larger dimensions and a higher price. The S8 series is a solution for packaging lines, food and beverage industries, automotive, test and assembling machines and electronic plants.	At 10mm wide and as the first fiber optic amplifier to be manufactured in Europe and equipped with a full 4 digit display, the S7 represents the ideal solution for all applications requiring high accuracy sensing combined with compact dimensions.

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Datalogic Compact Photoelectric

Series	S6	S60	S62	S90	
Appearance					
Page	visit www.IDEC.com/sensors				
Operating Distances	Through-beam	0 - 20m	0 - 20m, 0 - 60 class 1 laser	–	0 - 20m, 0 - 60m class 1 laser
	Retro-reflective	0.1 - 6m	–	–	–
	Polarized Retro-reflective	0.1 - 5m	0 - 3.2m, 0.1 - 6.5m, 0.1 - 20m class 1 laser	0.5 - 8.5m, 0.3 - 20m class 2 laser	0 - 3.2m, 0.1 - 6.5m, 0.1 - 20m class 1 laser
	Transparent	0.1 - 1m	0 - 1.7m	–	0 - 1.7m
	Diffuse	10 - 900mm, 50 - 2000mm	10 - 1000mm, 50 - 2000mm, 0 - 600mm class 1 laser	–	10 - 1000mm, 50 - 2000mm, 0 - 600mm class 1 laser
	Background suppression	1 - 100mm, 30 - 250mm, 100 - 500mm	70 - 200mm, 50 - 100mm class 1 laser	30 - 300mm, 60 - 600mm, 60 - 1200mm, 200 - 2000mm, 30 - 150mm class 2 laser, 50 350mm class 2 laser	70 - 200mm, 50 - 100mm class 1 laser
	Foreground suppression	50 - 200mm	70 - 200mm	–	70 - 200mm
Technical	Distance sensor	–	50 - 150mm	80 +/- 40mm class 2 laser	–
	Power supply	10 - 30VDC, 15 - 264VAC	10 - 30VDC	10 - 30VDC	10 - 30VDC
	Approximate dimensions (mm)	18 x 50 x 50	15 x 50 x 50	18 x 50 x 50	15 x 50 x 41
	Housing material	ABS	ABS	ABS	zinc plated aluminum
Highlights	The S6 series, thanks to the excellent detection performances and the variety of power supply and connection possibilities, offers the most complete universal sensor range in a compact 50x50 mm housing.	A sensitivity adjustment provides quick and precise setting of the switching threshold. These sensors also have an M12 connection that can be used straight or rotated to a right-angle position.	These sensors allow the operating distance to be adjusted to obtain the maximum immunity against color differences of the detected object or of the background, even if very reflective.	–	These sensors offer all the application and universal optic functions along with safety class 1 laser emission.
Mechanical protection	IP65	IP67	IP67	IP67	

Datalogic Maxi Photoelectric

Series	S20	
Appearance		
Page	visit www.IDEC.com/sensors	
Operating Distances	Through-beam	0.1 - 50m
	Retro-reflective	-
	Polarized Retro-reflective	0.1 - 8m
	Diffuse	0.1 - 2m
	Background suppression	10 - 50cm
Technical	Power supply	12 - 24VDC, 12 - 240VAC/DC
	Approximate dimensions (mm)	26 x 65 x 55
	Housing material	ABS
	Mechanical protection	IP66

Datalogic Proximity

Series	M4	M5	M8	M12	M18	M30
Appearance						
Page	visit www.IDEC.com/sensors					
Operating Distance	0.8mm	0.8mm	2mm shielded models, 3mm unshielded models	2mm shielded models, 4mm unshielded models	5mm shielded models, 8mm unshielded models	10mm shielded models, 15mm unshielded models
Repeatability	≤ 1%	≤ 1%	≤ 3%	≤ 3%	≤ 3%	≤ 3%
Hysteresis	< 10%	< 10%	< 10%	< 10%	< 10%	< 10%
Ripple	≥ 10%	≥ 10%	≥ 10%	≥ 10%	≥ 10%	≥ 10%
Switching Frequency	2000 Hz	2000 Hz	1000 Hz	1000 Hz	1000 Hz	300 Hz
Indicators	Yellow LED	Yellow LED	Yellow LED	Yellow LED	Yellow LED	Yellow LED
Power supply	10 - 30VDC	10 - 30VDC	10 - 30VDC	10 - 30VDC	10 - 30VDC	10 - 30VDC
Output	2 wires NO/NC	2 wires NO/NC	2 wires NO/NC	2 wires NO/NC, 3 wires NPN/PNP NO/NC, 4 wires NPN/PNP NO/NC, 4 wires programmable	2 wires NO/NC, 3 wires NPN/PNP NO/NC, 4 wires NPN/PNP NO/NC, 4 wires programmable	2 wires NO/NC, 3 wires NPN/PNP NO/NC, 4 wires NPN/PNP NO/NC, 4 wires programmable
Connections	cable, M8 connector	cable, M8 connector	cable, M8 connector, M12 connector	cable, M8 connector, M12 connector	cable, M8 connector, M12 connector	cable, M8 connector, M12 connector
Housing	standard	standard	standard, short	standard, short	standard, short	standard, short
Housing material	AISI-316L stainless steel	AISI-316L stainless steel	NI plated brass	NI plated brass, AISI-316L stainless steel	NI plated brass, AISI-316L stainless steel	NI plated brass
Mechanical protection	IP67	IP67	IP67	IP67	IP67	IP67

Datalogic Slot Sensors

Series	SR21	SR22	SRF
Appearance			
Page	visit www.IDEC.com/sensors		
Slot Sensor	2mm	2mm	30mm, 50mm, 80mm, 120mm
Slot depth	50mm	40mm	34mm, 54mm
Switching Frequency	25 kHz	10 kHz	1.5 kHz, 3 kHz
Light emission	IR LED, red/green LED	IR LED	red LED, class 2 red Laser
Setting	AUTO-SET push button	trimmer	trimmer
Power supply	10 - 30VDC	24VDC	10 - 30VDC
Output	PNP, NPN	PNP, NPN	PNP, NPN
Connections	connector	connector	connector
Approximate dimensions (mm)	20 x 90 x 26	14 x 68 x 37	10x50x59, 10x70x79, 10x100x79, 10x140x84
Housing material	zinc plated aluminum	aluminum	aluminum
Mechanical protection	IP65	IP60	IP65

Datalogic Contrast Sensors

Series	TL46	TL μ	TL50
Appearance			
Page	visit www.IDEC.com/sensors		
Distance	6 - 60mm	6 - 60mm, fiber optic: 0 - 3mm, 0 - 10mm	9mm
Switching Frequency	15 kHz, 20 kHz, 30 kHz	10 kHz, 20 kHz	15 kHz
Light emission	RGB LED	red/green LED, white LED	RGB LED
Setting	+/- SET pushbutton	MARK and BACKGROUND pushbuttons	MARK and BACKGROUND pushbuttons
Power Supply	10 - 30VDC	10 - 30VDC	10 - 30VDC
Output	PNP/NPN	PNP, NPN	NPN/PNP
Connection	cable, connector	cable, connector	connector
Approximate dimensions (mm)	31 x 81 x 58	31 x 81 x 58	31 x 81 x 53
Housing material	aluminum	zama	ABS
Mechanical protection	IP67	IP67	IP67

Datalogic Luminescence Sensors

Series	LD46	LD μ	LD50
Appearance			
Page	visit www.IDEC.com/sensors		
Distance	10 - 100mm	10 - 100mm, fiber optic: 0 - 30mm	0 - 60mm
Switching Frequency	2 kHz	2 kHz	2 kHz
Light emission	UV-HP LED	UV LED	UV-HP LED
Setting	+/- SET pushbuttons	MARK and BACKGROUND pushbuttons	+/- SET pushbuttons
Power Supply	15 - 30VDC	10 - 30VDC	15 - 30VDC
Output	NPN/PNP, 0-5V	PNP, NPN, 0 - 7V	NPN/PNP
Connection	cable, connector	cable, connector	connector
Approximate dimensions (mm)	31 x 81 x 58	31 x 81 x 58	31 x 81 x 53
Housing material	aluminum	zama	ABS
Mechanical protection	IP67	IP67	IP67

Datalogic Color Sensors

Series	S65-V
Appearance	
Page	visit www.IDEC.com/sensors
Distance	5 - 45mm
Switching Frequency	1.5 kHz (V09 version), 500 Hz (V19 version)
Light emission	RGB LED
Serial Interface	RS485
Setting	SET and SEL pushbuttons
Power Supply	10 - 30VDC
Output	PNP, NPN
Connection	connector
Approximate dimensions (mm)	50 x 50 x 25
Housing material	ABS
Mechanical protection	IP67

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Datalogic Distance Sensors

Series	S80	S81
Appearance		
Page	visit www.IDEC.com/sensors	
Distance	0.3 - 4m, 0.3 - 7m, 0.3 - 20.3m, 0.3 - 100.3m	0.3 - 4m
Digital Resolution	0.9mm, 0.4mm, 0.6mm, 6mm	0.9mm
Linearity	0.3%, 0.25%, 0.15%	—
Switching Frequency	100 Hz (Normal), 500 Hz (Fast)	80 Hz
Light Emission	Class 2 red laser	Class 2 red laser
Response time	5 ms (Normal), 1ms (Fast)	6 ms
Serial Interface	RS485	—
Setting	Teach-in	Teach-in
Hysteresis	—	30 mm
Power supply	15 - 30VDC	15 - 30VDC
Output	PNP, 4-20mA	PNP, NPN, 0 - 10V
Connection	M12 connector	M12 connector
Approximate dimensions (mm)	34 x 90 x 73	58 x 31 x 31
Housing material	aluminum	ABS
Mechanical protection	IP67	IP67

Datalogic Area Sensors

Series	AS1-HR	AS1-SR
Appearance		
Page	visit www.IDEC.com/sensors	
Height	100 mm	100 mm
Resolution	0.2 x 75mm, ø 6 mm	0.2 x 200mm, ø 18 mm
Switching Frequency	500 Hz	500 Hz
Light Emission	IR LED	IR LED
Operating Distance	0.3 - 1.9m, 0.8 - 3m	0.3 - 1.9m, 0.8 - 3m
Power supply	10 - 30VDC	10 - 30VDC
Output	PNP	PNP
Connection	connector	connector
Approximate dimensions (mm)	20 x 41 x 150	20 x 41 x 150
Housing material	aluminum	aluminum
Mechanical protection	IP67	IP67

Datalogic Measurement Light Arrays

Series	DS1	DS2	DS3
Appearance			
Page	visit www.IDEC.com/sensors		
Controlled Height	100 - 300mm	150 - 1650mm	150 - 600mm
Resolution	4 - 10mm	Digital resolution : 12/35mm, Absolute measure precision: 6/22.5mm	0.5/0.8mm (crossed beams), 6mm (parallel beams)
Number of beams	16 - 48	21 - 231 (res=12mm), 1 - 36 (res=35mm)	24 - 96
Light emission	IR	IR	IR
Response time	1 - 2.75ms	5 - 90ms	3 - 12ms (crossed beams), 23 - 92 ms (parallel beams)
Serial Interface	–	RS485, Ethernet	–
Setting	Trimmer	Dip-switch, Graphic interface	Teach-in
Operating Distance	0.15 - 0.8m, 0.15 - 2.1m, 0.2 - 4m	0.3 - 5m (res=12mm), 0.3 - 10m (res=35mm)	0.2 - 2m
Power Supply	24VDC	24VDC	24VDC
Output	PNP, 0 - 10VDC	PNP, 0 - 10VDC	PNP, 0 - 10VDC
Approximate dimensions (mm)	20 x 41	35 x 40	35 x 40
Housing material	aluminum	aluminum	aluminum
Mechanical protection	IP65	IP66	IP66

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SA1E Miniature Photoelectric Switches

Key features:

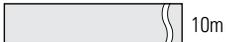
- Seven sensing methods: through-beam, polarized retroreflective, small beam reflective, diffuse, background suppression, convergent, and transparent.
- 2m cable type and M8 connector.
- NPN output, PNP output, light ON, dark ON can be selected.
- Coaxial polarized retro-reflective type (SA1E-X) available for sensing transparent objects.
- Background suppression (SA1E-B) type detects objects only, ignoring the background.
- Red LED available for easy alignment in long distance applications (SA1E-T, -P, -N, and -B)
- Convergent reflective type (SA1E-G) is ideal for detecting objects at a short distance with a background.
- Also available without sensitivity adjustment (SA1E-T, -P)
- Air blower mounting block for installing an air blower to clean the lens surface. Ideal to maintain a clean lens surface and sensor performance.
- UL Listed and CE marked
- IP67



Part Numbers



Photoelectric Switches

Sensing Method		Sensing Range	Connection	Cable Length	Operation Mode	Part No.	
						NPN Output	PNP Output
Through-beam	Infrared LED w/Sensitivity Adjustment	 10m	Cable	2m	Light ON	SA1E-TN1-2M	SA1E-TP1-2M
					Dark ON	SA1E-TN2-2M	SA1E-TP2-2M
			Connector	-	Light ON	SA1E-TN1C	SA1E-TP1C
					Dark ON	SA1E-TN2C	SA1E-TP2C
	Infrared LED w/o Sensitivity Adjustment	 15m	Cable	2m	Light ON	SA1E-TN1-NA-2M	SA1E-TP1-NA-2M
					Dark ON	SA1E-TN2-NA-2M	SA1E-TP2-NA-2M
			Connector	-	Light ON	SA1E-TN1C-NA	SA1E-TP1C-NA
					Dark ON	SA1E-TN2C-NA	SA1E-TP2C-NA
	Red LED w/Sensitivity Adjustment	 10m	Cable	2m	Light ON	SA1E-TAN1-2M	SA1E-TAP1-2M
					Dark ON	SA1E-TAN2-2M	SA1E-TAP2-2M
			Connector	-	Light ON	SA1E-TAN1C	SA1E-TAP1C
					Dark ON	SA1E-TAN2C	SA1E-TAP2C
Class 1 Laser w/Sensitivity Adjustment	 30m	Cable	2m	Light ON/ Dark ON	SA1E-LTN3-2M	SA1E-LTP3-2M	
		Connector	-	Light ON/ Dark ON	SA1E-LTN3C	SA1E-LTP3C	

Photoelectric Switches

Sensing Method		Sensing Range	Connection	Cable Length	Operation Mode	Part No.	
						NPN Output	PNP Output
Polarized Retroreflective	Red LED		Cable	2m	Light ON	SA1E-PN1-2M	SA1E-PP1-2M
					Dark ON	SA1E-PN2-2M	SA1E-PP2-2M
			Connector	-	Light ON	SA1E-PN1C	SA1E-PP1C
					Dark ON	SA1E-PN2C	SA1E-PP2C
	w/Sensitivity Adjustment	<p>(Note) 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 179.</p>	Cable	2m	Light ON	SA1E-PN1-NA-2M	SA1E-PP1-NA-2M
					Dark ON	SA1E-PN2-NA-2M	SA1E-PP2-NA-2M
			Connector	-	Light ON	SA1E-PN1C-NA	SA1E-PP1C-NA
					Dark ON	SA1E-PN2C-NA	SA1E-PP2C-NA
Class 1 Laser	w/Sensitivity Adjustment		Cable	2m	Light ON/ Dark ON	SA1E-LPN3-2M	SA1E-LPP3-2M
			Connector	-	Light ON/ Dark ON	SA1E-LPN3C	SA1E-LPP3C
Diffuse-reflective	Infrared LED		Cable	2m	Light ON	SA1E-DN1-2M	SA1E-DP1-2M
					Dark ON	SA1E-DN2-2M	SA1E-DP2-2M
	w/Sensitivity Adjustment	-	Light ON	SA1E-DN1C	SA1E-DP1C		
			Dark ON	SA1E-DN2C	SA1E-DP2C		
Small-beam Reflective	Red LED		Cable	2m	Light ON	SA1E-NN1-2M	SA1E-NP1-2M
					Dark ON	SA1E-NN2-2M	SA1E-NP2-2M
	w/Sensitivity Adjustment	-	Light ON	SA1E-NN1C	SA1E-NP1C		
			Dark ON	SA1E-NN2C	SA1E-NP2C		
Background Suppression	Red LED		Cable	2m	Light ON	SA1E-BN1-2M	SA1E-BP1-2M
					Dark ON	SA1E-BN2-2M	SA1E-BP2-2M
			Connector	-	Light ON	SA1E-BN1C	SA1E-BP1C
	w/Sensing Range Adjustment		Dark ON	SA1E-BN2C	SA1E-BP2C		
Class 1 Laser	w/Sensitivity Adjustment		Cable	2m	Light ON/ Dark ON	SA1E-LBN3-2M	SA1E-LBP3-2M
			Connector	-	Light ON/ Dark ON	SA1E-LBN3C	SA1E-LBP3C

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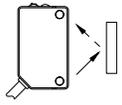
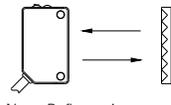
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Sensing Method			Sensing Range	Connection	Cable Length	Operation Mode	Part No.	
							NPN Output	PNP Output
Convergent Reflective	Infrared LED	w/Sensitivity Adjustment	 <p>5 to 35 mm</p>	Cable	2m	Light ON	SA1E-GN1-2M	SA1E-GP1-2M
						Dark ON	SA1E-GN2-2M	SA1E-GP2-2M
				Connector	-	Light ON	SA1E-GN1C	SA1E-GP1C
						Dark ON	SA1E-GN2C	SA1E-GP2C
Coaxial Polarized Retro-reflective	Red LED	w/Sensitivity Adjustment	 <p>Note: Reflector is not supplied and must be ordered separately. See characteristics diagrams on page 179.</p> <p>2.0m (when using IAC-R9)</p> <p>1.0m [100 mm] (when using IAC-R10)</p> <p>1.0m [100 mm] (when using IAC-R11)</p>	Cable	2m	Light ON	SA1E-XN1-2M	SA1E-XP1-2M
						Dark ON	SA1E-XN2-2M	SA1E-XP2-2M
				Connector	-	Light ON	SA1E-XN1C	SA1E-XP1C
						Dark ON	SA1E-XN2C	SA1E-XP2C

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Specifications

Sensing Method	Through-beam	Polarized Retroreflective	Diffuse-reflective	Small-beam Reflective	Background Suppression (BGS)	Convergent Reflective	Transparent	
Part No.	SA1E-□T	SA1E-□P	SA1E-D	SA1E-N	SA1E-□B	SA1E-G	SA1E-X	
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 Laser Receiver: 30 mA	30 mA with laser: 35 mA					20 mA maximum	
Sensing Range	With sensitivity adjustment: 10m Laser models: 30m	With sensitivity adjustment: 2.5m (IAC-R5/R8) 1.5m (IAC-R6) 1.3m (IAC-RS2) 1.0m (IAC-RS1) 0.8m (IAC-R7□) ¹ Laser models 0.3-10m	700 mm (using 200 × 200 mm white mat paper)	50 to 150 mm (using 100 × 100 mm white mat paper)	20 mm to preset (using 200 × 200 mm white mat paper) with laser: 20 - 300mm	5 to 35 mm (using 100 × 100 mm white mat paper)	2m (when using IAC-R9)	
	Without sensitivity adjustment: 15m	Without sensitivity adjustment: 3.0m (IAC-R5/R8) 2.0m (IAC-R6) 1.4m (IAC-RS2) 1.1m (IAC-RS1) 1.0m (IAC-R7□) ¹						
Adjustable Sensing Range	—				40 to 200 mm with laser: 40-300mm	—	—	
Detectable Object	Opaque		Opaque/Transparent		Opaque	Opaque/ Transparent	Opaque, transparent and mirror-like objects	
Hysteresis	—		20% maximum		10% maximum	20% maximum	—	
Response Time	1 ms maximum with laser: 250us						500 μs maximum	
Sensitivity Adjustment	Adjustable using a potentiometer (approx. 260°) Through-beam type and polarized retroreflective type are also available without sensitivity adjustment. Laser models: 2 turn adjustment				—	Adjustable using a potentiometer (approx. 260°)	Adjustable using a potentiometer (approx. 240°)	
Sensing Range Adjustment	—				6-turn control knob	—	—	
Light Source Element	Infrared LED Red LED Red laser diode	Red LED Red laser diode	Infrared LED	Red LED	Red LED Red laser diode	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 (BGS type: 2V maximum) Short-circuit protection							
LED Indicators	Operation LED: Yellow Stable LED: Green Power LED: Green (Through-beam type projector)				Operation LED: Yellow Stable LED: None	Operation LED: Yellow Stable LED: Green	Operation LED: Yellow Stable LED: None	
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)							



- Maintain at least the distance shown below between the SA1E photoelectric switch and reflector.
IAC-R5/R6/R7□/R8: 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.
- Cable length: 1m (50g when the cable length is 2m, 55g for laser models. 110g when the cable length is 5m, 120g for laser models.)
- Cable length: 1m (55g when the cable length is 2m. 120g when the cable length is 5m.)
- For laser models insert L in place of □.

Specifications, con't

Sensing Method	Through-beam	Polarized Retroreflective	Diffuse-reflective	Small-beam Reflective	Background Suppression (BGS)	Convergent Reflective	Transparent
Part No.	SA1E-T	SA1E-P	SA1E-D	SA1E-N	SA1E-B	SA1E-G	SA1E-X
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 / coaxial polarized retro-reflective: PMMA), Indicator cover: PC						
Attachments	Instruction sheet						
Weight (approx.)	Cable Model	Projector: 30g Laser Projector: 35g Receiver: 30g ² Laser Receiver: 35g	30g ² with laser: 35g		35g ³	30g ²	35g ³
	Connector Model	Projector: 10g Laser Projector: 20g Receiver: 10g Laser Receiver: 20g	10g with Laser 20g		20g	10g	20g
Connection Method	Cable Model	ø3.5 mm, 3-core, 0.2 mm ² , 1-m vinyl cabtyre cable (2-core for the projector of through-beam type)					
	Connector Model	M8 connector (4-pin)					



- Maintain at least the distance shown below between the SA1E photoelectric switch and reflector.

IAC-R5/R6/R7□/R8: 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.

- Cable length: 1m (50g when the cable length is 2m, 55g for laser models. 110g when the cable length is 5m, 120g for laser models.)
- Cable length: 1m (55g when the cable length is 2m. 120g when the cable length is 5m.)
- For laser models insert L in place of □.

Slit and Sensing Range

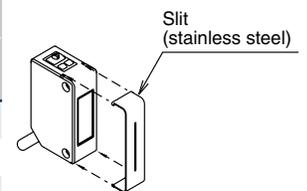
A slit, which changes the beam size of through-beam sensors, can easily be attached to the sensing side of the through-beam projector and receiver. Three different slit widths are available.

Part No.	Slit Width: A	w/Sensitivity Adjustment				w/o Sensitivity Adjustment			
		Sensing Range (m)		Minimum Detectable Object Width (mm)		Sensing Range (m)		Minimum Detectable Object Width (mm)	
		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.

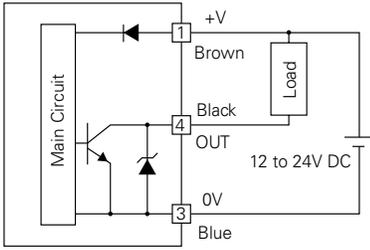
The slit can be pressed to snap onto the front easily.



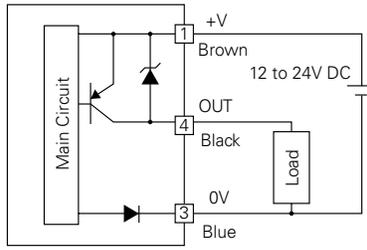
Horizontal slits and round slits have an orientation. Make sure that the TOP marking comes on top of the sensor (LED side).

Output Circuit & Wiring Diagram

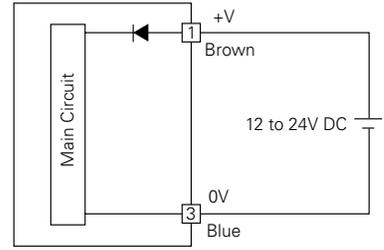
NPN Output



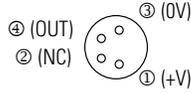
PNP Output



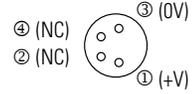
Through-beam Type Projector



(Connector Pin Assignment)



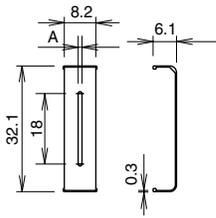
(Connector Pin Assignment)



Dimensions (mm)

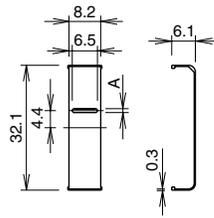
Vertical Slit

SA9Z-S06
SA9Z-S07
SA9Z-S08



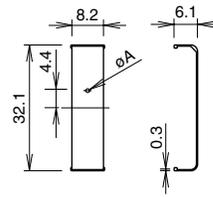
Horizontal Slit

SA9Z-S09
SA9Z-S10
SA9Z-S11



Round Slit

SA9Z-S12
SA9Z-S13
SA9Z-S14

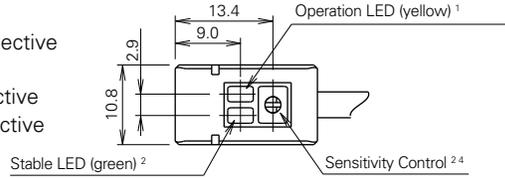


Material: Stainless Steel

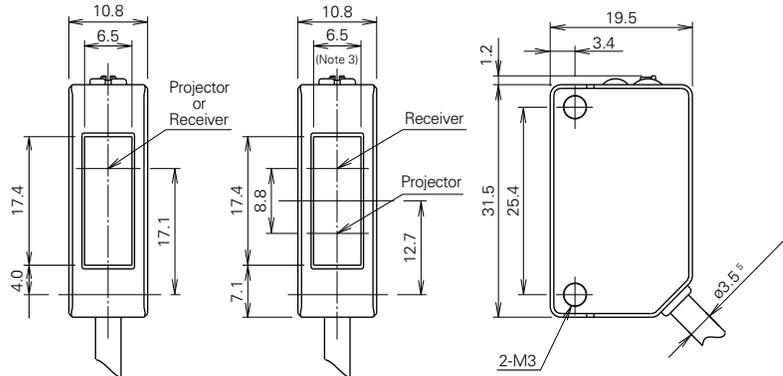
Cable Model
Through-beam



- Through-beam
- Polarized retroreflective
- Diffuse-reflective
- Small-beam reflective
- Convergent Reflective



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



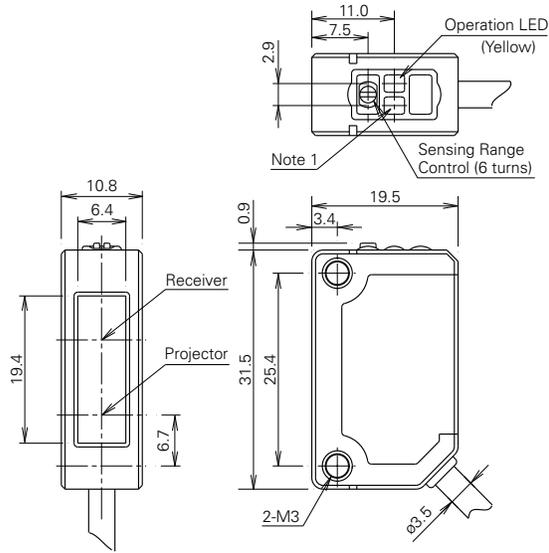
1. Power ON LED (green) for through-beam projector
2. No sensitivity control and stable LED are attached on the through-beam projector.
3. 5.2 mm for polarized retroreflective type
4. No sensitivity control is installed on the type without sensitivity adjustment.

Cable Model

Background Suppression (BGS)



- 1. Stable LED is not provided on the background suppression type.

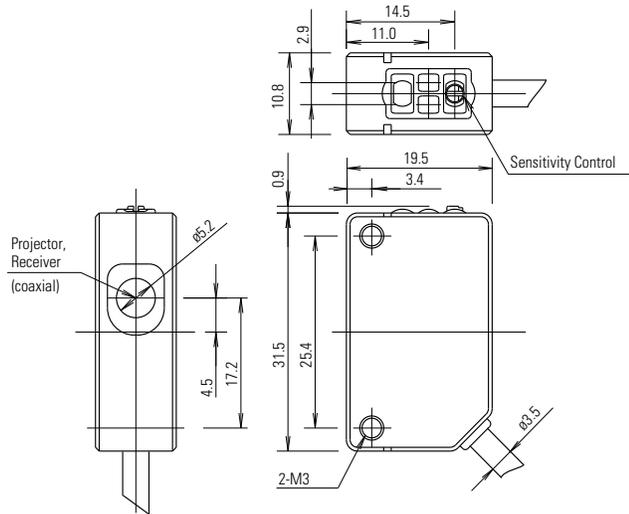


Cable Model

Coaxial Polarized Retro-reflective



- 1. Stable LED is not provided on the coaxial polarized retro-reflective type.

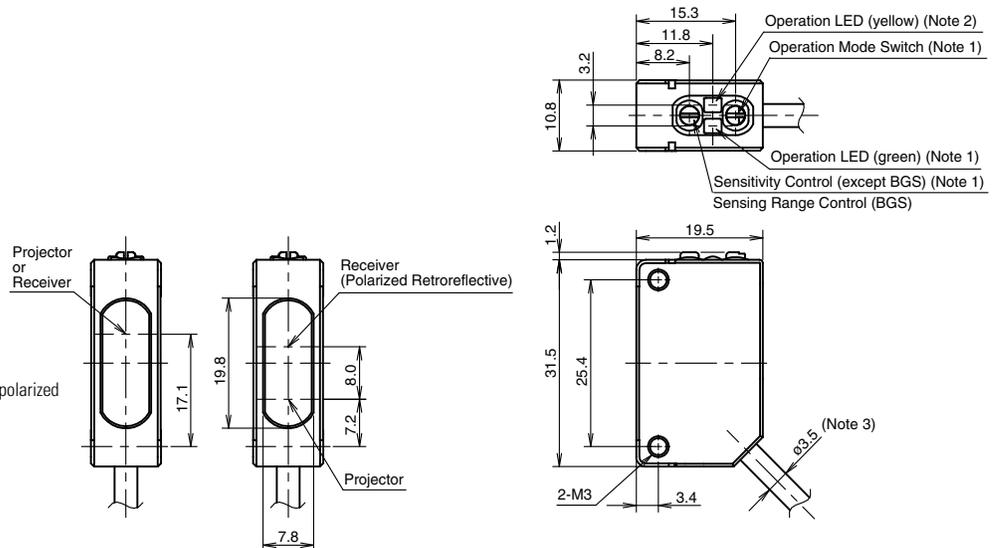


Cable Model (Laser)

Through-beam
Polarized Retroreflective
Background Suppression



- 1. Stable LED is not provided on the coaxial polarized retro-reflective type.



01 Touchscreens

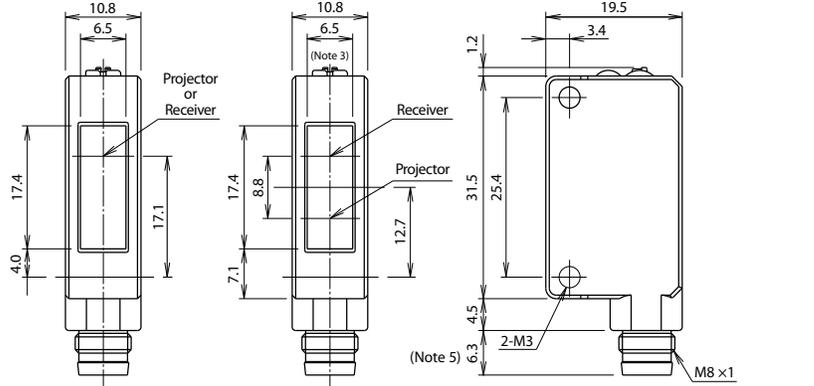
Connector Model

Through-beam



- Through-beam
- Polarized retroreflective
- Diffuse-reflective
- Small-beam reflective
- Convergent Reflective

Polarized retroreflective
Diffuse-reflective
Small-beam reflective
Convergent reflective



- 1. Power ON LED (green) for through-beam projector
- 2. No sensitivity control and stable LED are attached on the through-beam projector.
- 3. 5.2 mm for polarized retroreflective type
- 4. No sensitivity control is installed on the type without sensitivity adjustment.

PLCs

Automation Software



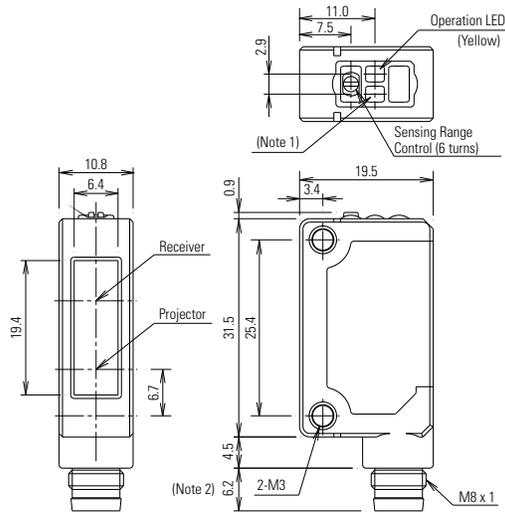
Power Supplies

Connector Model

Background Suppression (BGS)



- 1. Stable LED is not provided on the background suppression type.
- 2. The connector length is 18 mm when a right-angle connector cable.



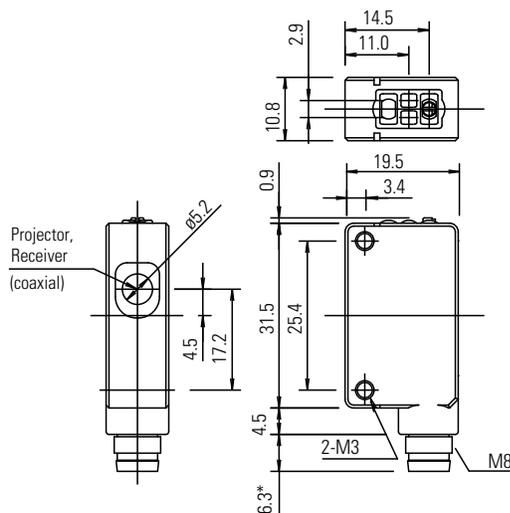
Sensors

Connector Model

Coaxial Polarized Retro-reflective



- 1. Stable LED is not provided on the coaxial polarized retro-reflective type.

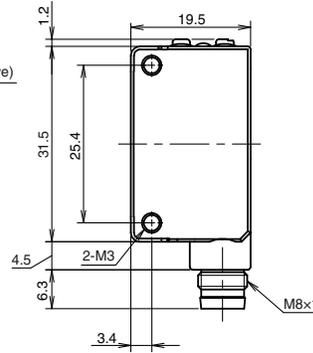
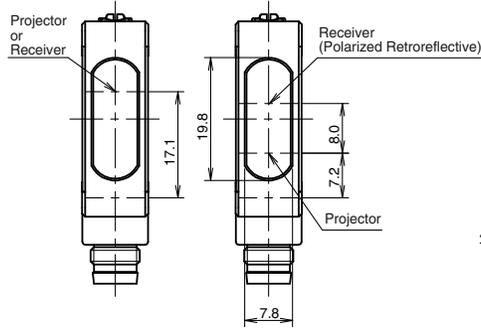
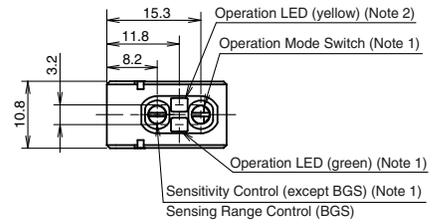


Communication

Barriers

Connector Model (Laser)

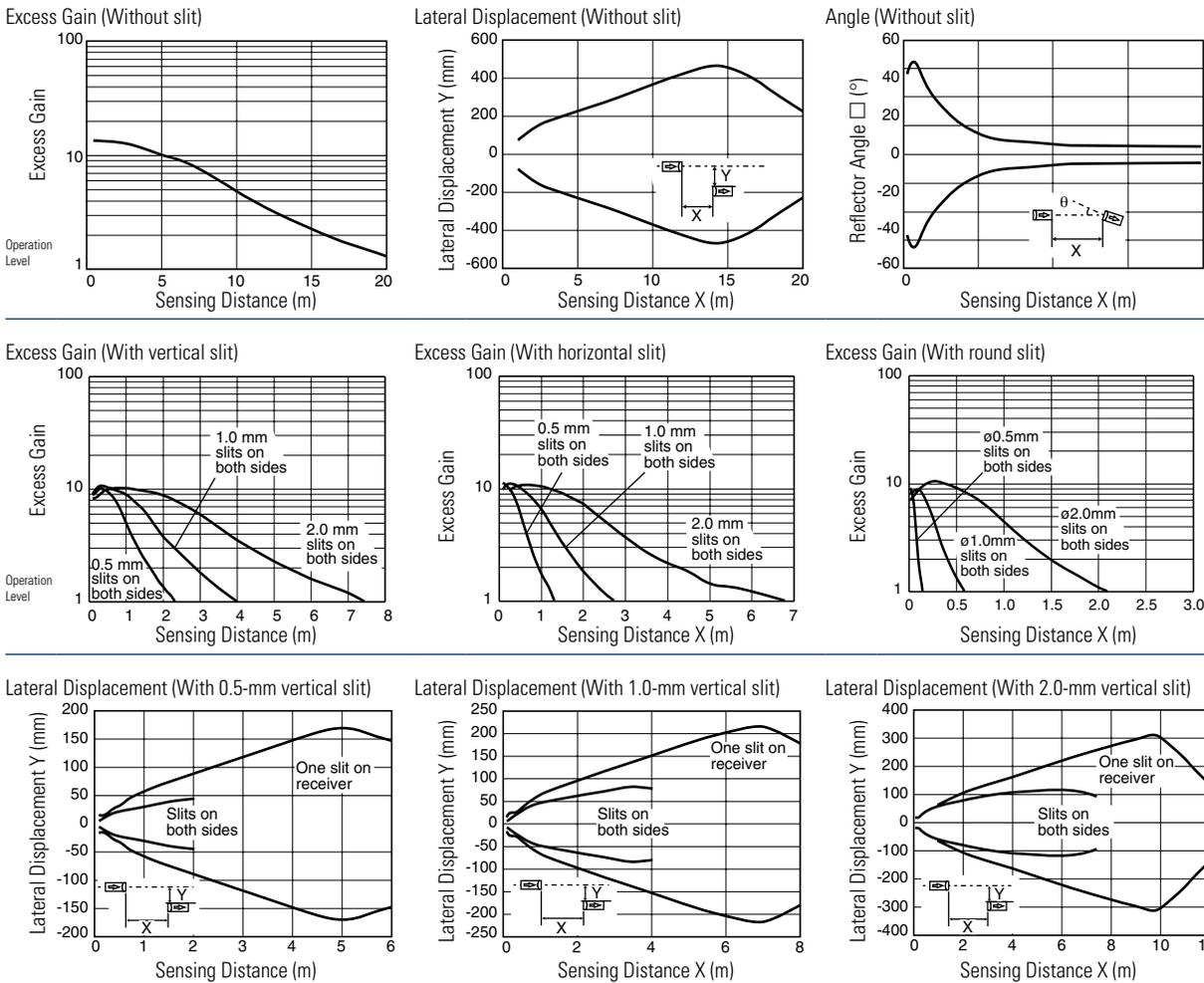
Through-beam
Polarized Retroreflective
Background Suppression



1. Stable LED is not provided on the coaxial polarized retro-reflective type.

Characteristics (Typical)

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



OT Touchscreens

PLCs

Automation Software

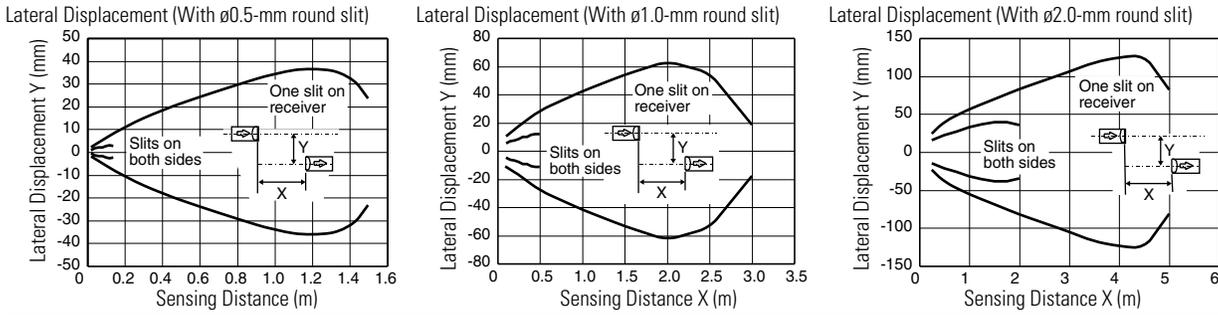
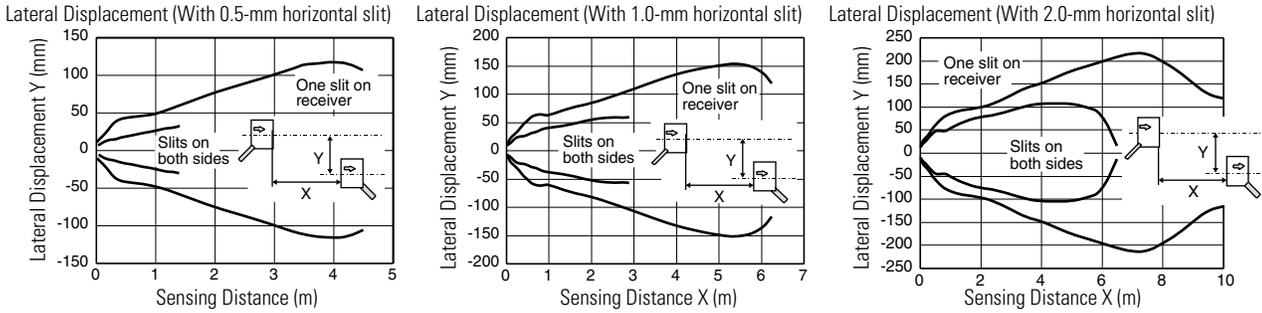
Power Supplies

Sensors

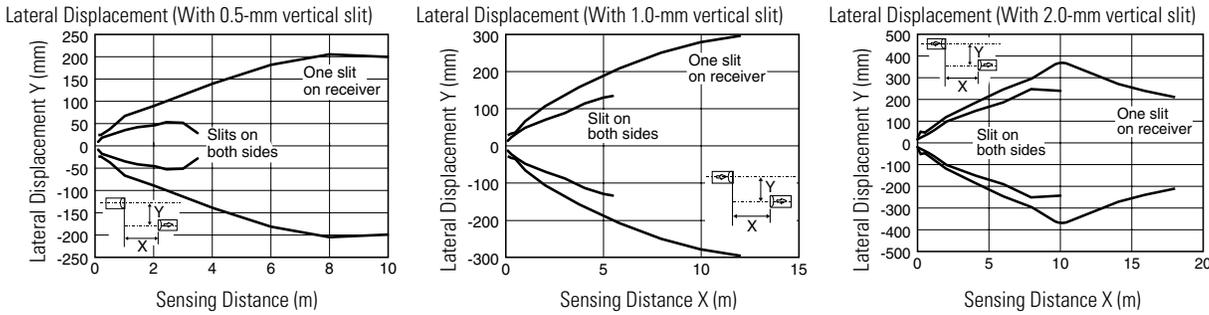
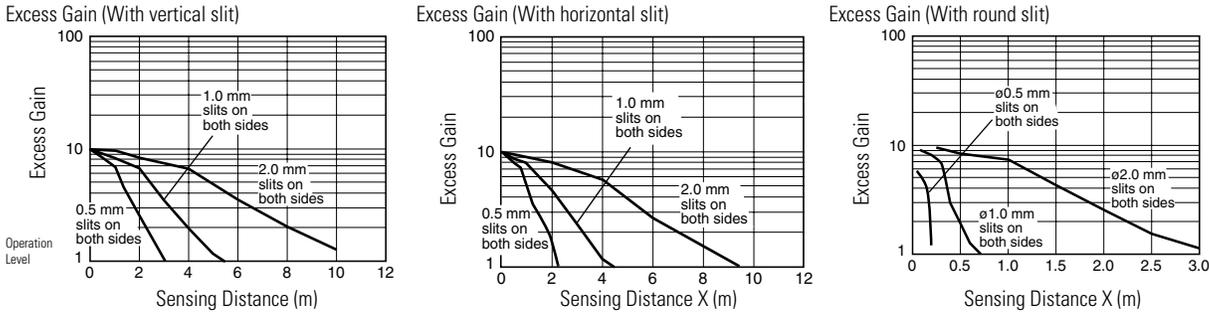
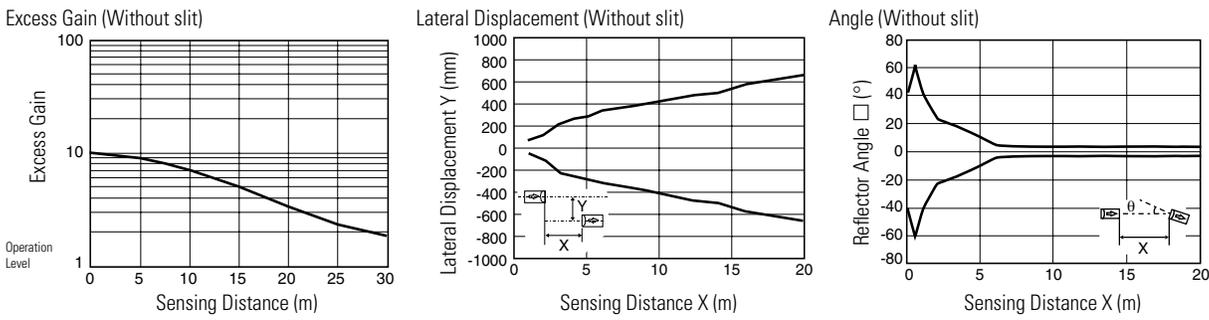
Communication

Barriers

Characteristics (Typical)



1-2. Through-beam SA1E-T□-NA (Infrared LED w/o sensitivity adjustment)



OI Touchscreens

PLCs

Automation Software

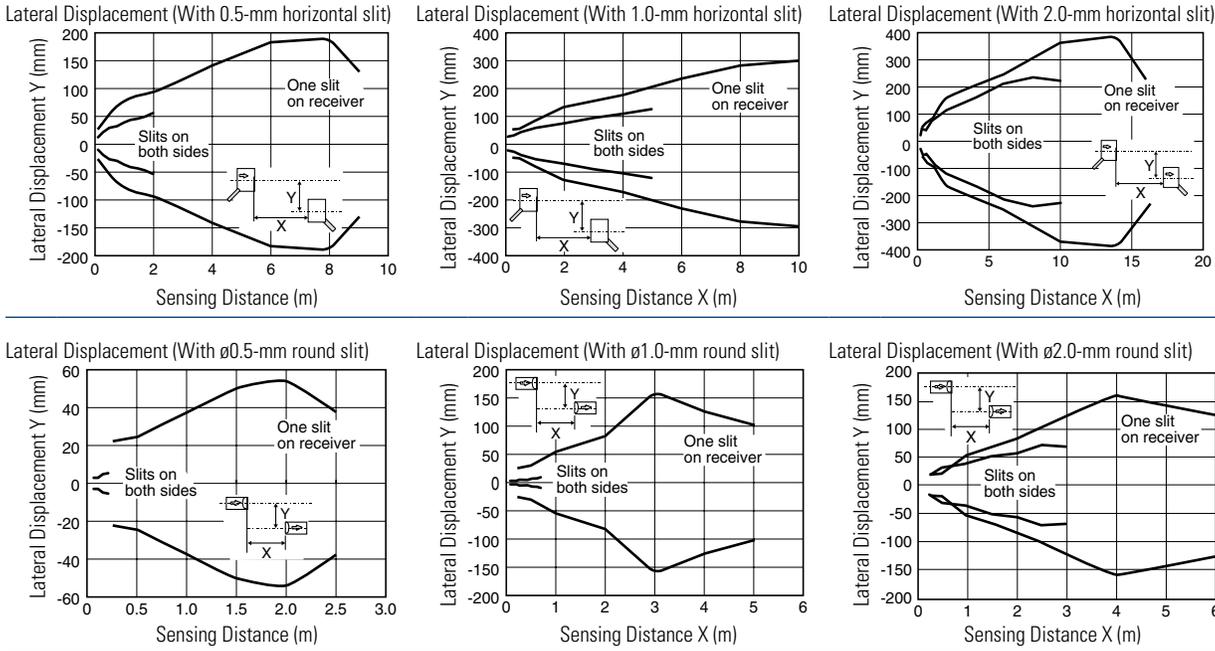
Power Supplies

Sensors

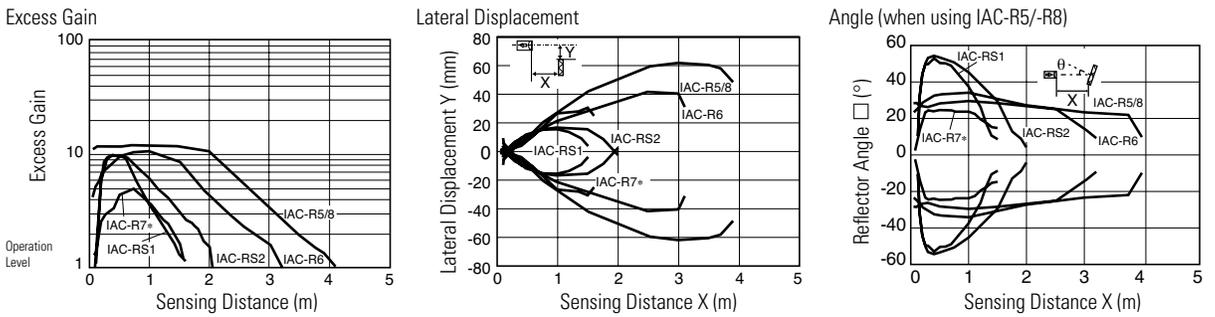
Communication

Barriers

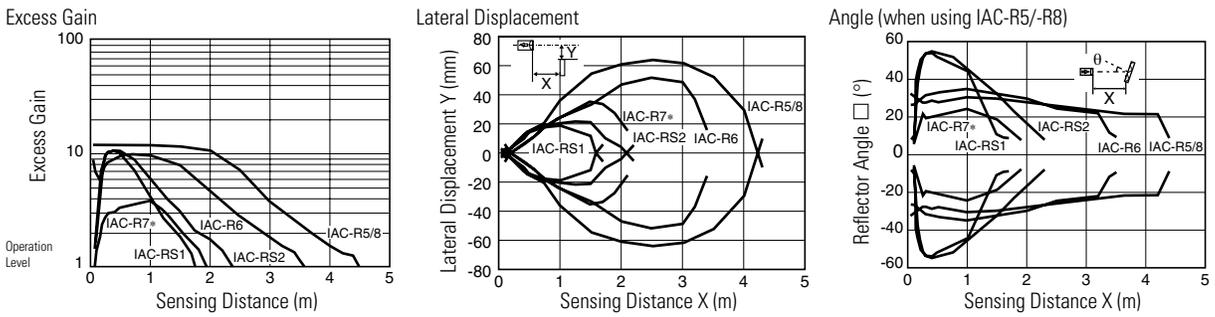
Characteristics (Typical)



2-1. Polarized Retroreflective SA1E-P (Red LED w/sensitivity adjustment)



2-2. Polarized Retroreflective SA1E-PC-NA (Red LED w/o sensitivity adjustment)



OT Touchscreens

PLCs

Automation Software

Power Supplies

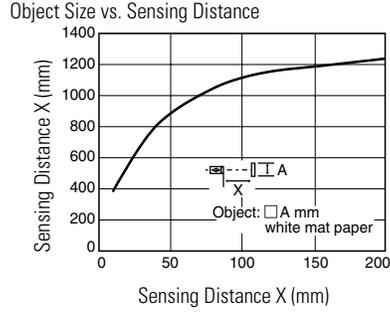
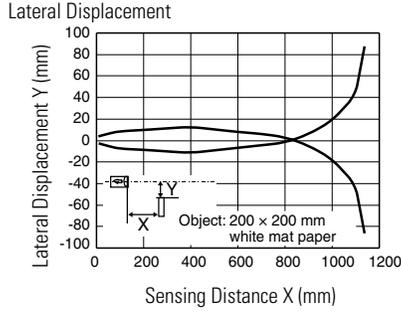
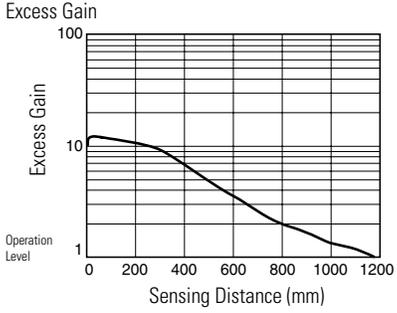
Sensors

Communication

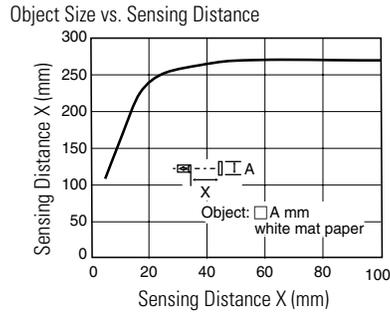
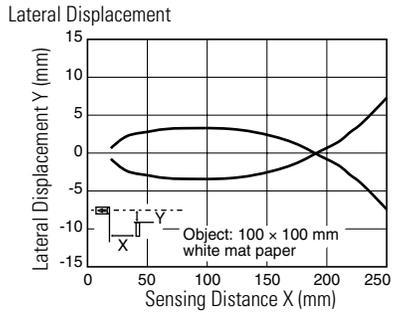
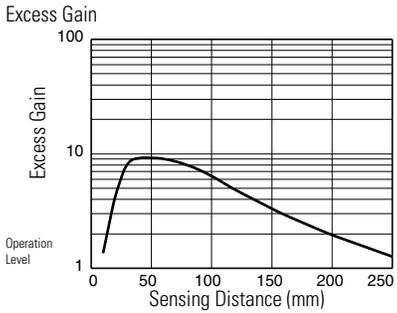
Barriers

Characteristics (Typical)

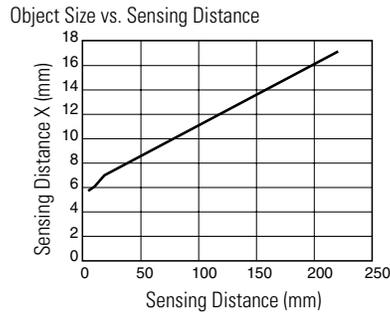
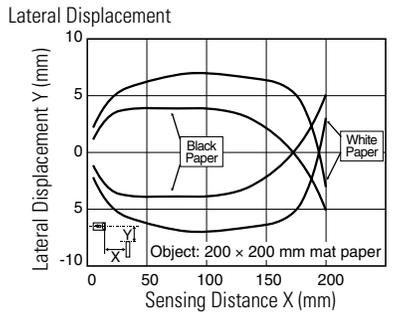
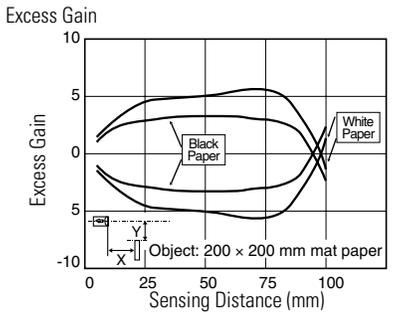
3. Diffuse-Reflective SA1E-D (Infrared LED w/sensitivity adjustment)



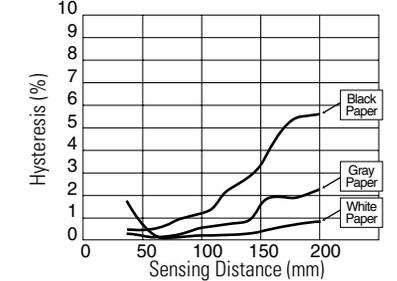
4. Small-beam Reflective SA1E-N (Red LED w/sensitivity adjustment)



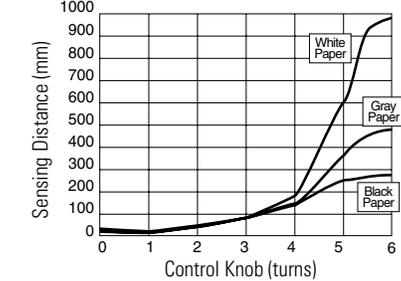
5. Background Suppression SA1E-B (Red LED w/sensitivity adjustment)



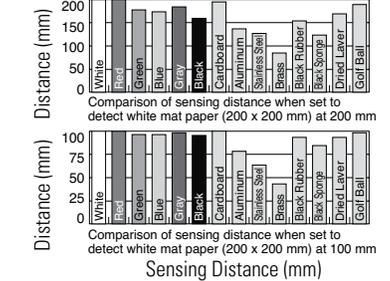
Sensing Distance vs. Hysteresis



Control Knob vs. Sensing Distance



Color Mat Paper and Other Materials



01 Touchscreens

PLCs

Automation Software

Power Supplies

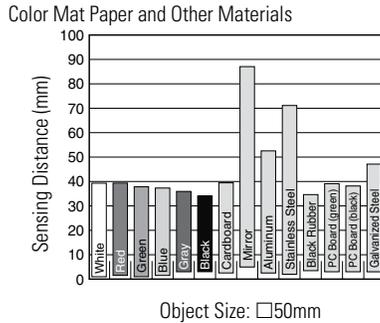
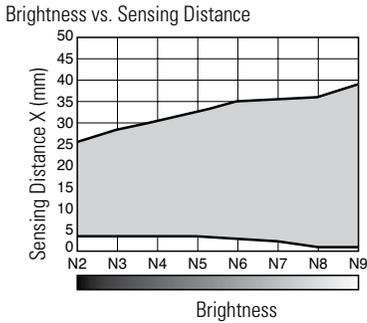
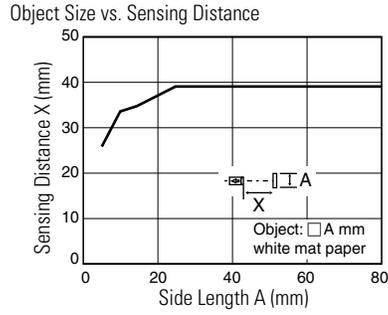
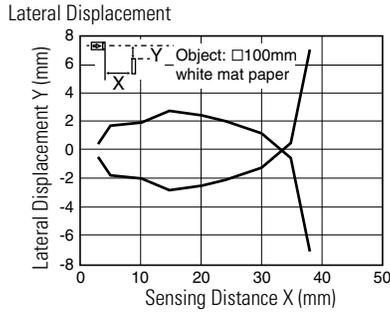
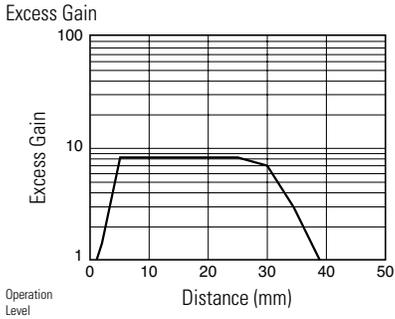
Sensors

Communication

Barriers

Characteristics (Typical)

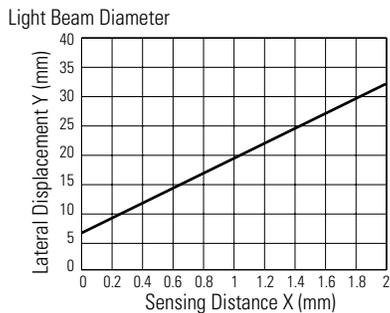
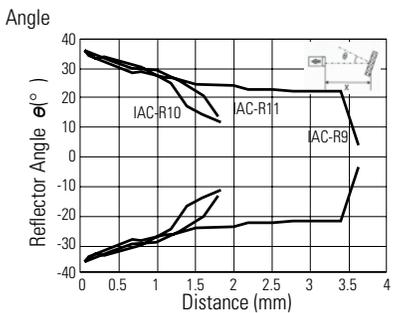
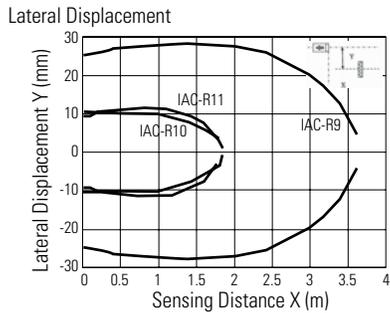
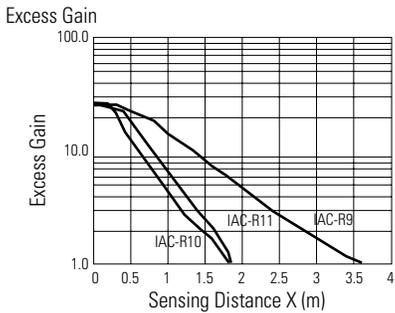
6. Convergent Reflective SA1E-G (Infrared LED w/sensitivity adjustment)



- The graph on the left shows the sensing distances for different colors and materials and can be used as a reference when setting the distance. Because sensing distance depends on the object's size and surface condition, provide a sufficient distance.
- Note that sensing may be affected by reflective object behind the sensing object.
- Referring to the graph on the left, provide a sufficient distance between the photoelectric switch and background.

Object: Colour chips of colour standards according to JIS Z8721 (Non Glossy Edition)

7. Coaxial Polarized Retro-reflective SA1E-X



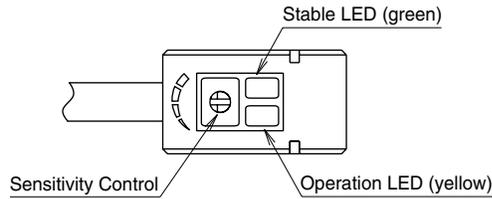
Safety Precautions

Turn off power to the SA1E Miniature Photoelectric Switches before installation, removal, wiring, maintenance, and inspection. Failure to turn power off may cause electrical shock or fire hazard.

Instructions

1. Indicator and Output Operation

(except for background suppression type)



- 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.

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 retroreflective

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.

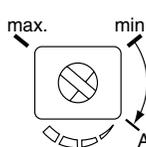
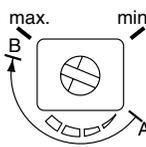
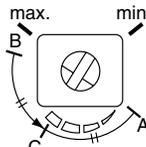
Receiving Light Intensity Level	Light Receiving Status	Stable LED (green)	Operation LED (yellow)/ Control Output	
			Light ON	Dark ON
Operation Level	1.2 and over	Stable Incident	ON	OFF
	1.0	Unstable Incident	ON	OFF
		Unstable Interruption	OFF	ON
0.8 and below	Stable Interruption	ON	OFF	ON

Diffuse-reflective/Small-beam reflective/Convergent 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 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.

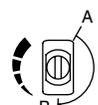
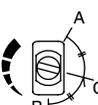
3. Sensitivity Adjustment

- Referring to the table to the right, 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 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.

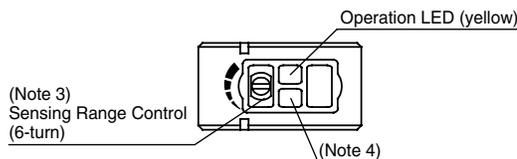
Step	Photoelectric Switch Status	Sensitivity Control	Adjusting Procedure
1	Receiving light • Through-beam, polarized reflective: No object detected • Diffuse reflective, small-beam reflective, convergent reflective: Object detected		Turn the control counter-clockwise to the minimum. Then turn clockwise until the operation LED turns on (turns off with dark ON type) (point A).
2	Light is interrupted • Through-beam, polarized reflective: Object detected • Diffuse reflective, small-beam reflective, convergent reflective: 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. Adjustment of Sensing Range for Background Suppression (BGS) Type

- When adjusting the sensing range, follow the instructions below.

Step	Distance Control	Adjusting Procedure
1		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		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.

- When the background is far off and not detected, turn the control 360°, and set the point as point C.
- Because the control is multi-turn, it may take more than one turn to move from point A to point B.



- Turning the control clockwise lengthens the sensing distance.
- Background suppression (BGS) type is not provided with a stable LED.

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 type: 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 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 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 type receiver away from intense extraneous light.
- Interference prevention allows two SA1E switches to be mounted in close proximity. However, the through-beam type is not equipped with interference prevention. Maintain appropriate distance between the switches referring to the lateral displacement characteristics on pages 179, 180, and 181.
- 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

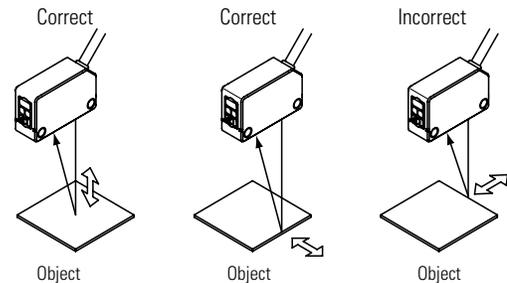
- Use M4 mounting screws for the IAC-R5 reflector and M5 mounting screws for the IAC-R6 reflector. Tighten the mounting screws to a tightening torque of 0.5 N·m maximum. Mounting screws are not supplied with the switch.
- Use the M3 self-tapping screw, flat washer, and spring washer to tighten the IAC-R7 reflector to a torque of 0.5 to 0.6 N·m.
- 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 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 supplied 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.

Installing the background suppression (BGS) type

- 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.



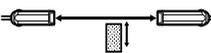
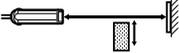
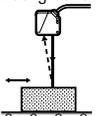
SA1U Heavy Duty Photoelectric Sensors

Key features:

- Universal voltage
AC Universal Type: 24 to 240V AC and 12 to 240V DC.
DC Type: 12 to 24V DC.
- IP67 rated
- Four sensing methods: through-beam, polarized retro-reflective, diffuse-reflective, and background suppression.
- Mounting hole centers: 40, 50 to 55 mm
- Operation and stable LED indicators.
- SPDT contact for relay output type.
- Transistor output type has NPN and PNP open collector dual outputs.
- Interference prevention allows two units to be mounted in close proximity (except through-beam type).
- Spring-up terminal block structure enables easy wiring. Wiring can be extended to up to 100m using $\varnothing 8$ to $\varnothing 10$ mm round cables.



Part Numbers

Sensing Method	Detectable Object	Sensing Range	Power Voltage	Control Output	Time Delay Functions	Part No.
 Through-Beam	Opaque	50m max.	24 to 240V AC (50/60Hz) 12 to 240V DC	Relay contact SPDT 250V AC/3A, 30V DC/3A (resistive load)	Without	SA1U-T50M
					With	SA1U-T50MT
			12 to 24V DC	NPN/PNP open collector	Without	SA1U-T50MW
	With	SA1U-T50MWT				
 Polarized Retroreflective	Opaque Mirror surface	7m max.	24 to 240V AC (50/60Hz) 12 to 240V DC	Relay contact SPDT 250V AC/3A, 30V DC/3A (resistive load)	Without	SA1U-P07M
					With	SA1U-P07MT
			12 to 24V DC	NPN/PNP open collector	Without	SA1U-P07MW
	With	SA1U-P07MWT				
 Diffuse	Opaque Transparent	1m max.	24 to 240V AC (50/60Hz) 12 to 240V DC	Relay contact SPDT 250V AC/3A, 30V DC/3A (resistive load)	Without	SA1U-D01M
					With	SA1U-D01MT
			12 to 24V DC	NPN/PNP open collector	Without	SA1U-D01MW
	With	SA1U-D01MWT				
 Background Suppression	Opaque	2m max.	24 to 240V AC (50/60Hz) 12 to 240V DC	Relay contact SPDT 250V AC/3A, 30V DC/3A (resistive load)	Without	SA1U-B02M
					With	SA1U-B02MT
			12 to 24V DC	NPN/PNP open collector	Without	SA1U-B02MW
	With	SA1U-B02MWT				

Specifications

Universal Voltage Models

Sensing Method	Through-Beam	Polarized Retroreflective	Diffuse	Background Suppression
Part Number	SA1U-T50M SA1U-T50MT	SA1U-P07M SA1U-P07MT	SA1U-D01M SA1U-D01MT	SA1U-B02M SA1U-B02MT
Power Voltage	24 to 240V AC (21.6 to 264V AC) 50/60Hz, 12 to 240V DC (10.8 to 264V DC) compatible			
Power Consumption	Projector: 3 VA maximum Receiver: 3 VA maximum	3 VA maximum		
Control Output	Relay contact SPDT, switching capacity: 250V AC/3A (resistive load), 30V DC/3A (resistive load) Electrical life (minimum operations): 100,000 (NO contact), 50,000 (NC contact) Mechanical life (minimum operations): 50,000,000			
Minimum Applicable Load	5V DC, 10 mA minimum (reference value)			
Response Time	20 ms maximum			
Insulation Resistance	Between power and output terminals: 20 MΩ minimum (500V DC megger)			
Dielectric Strength	Between power and output terminals: 1500V AC, 1 minute, Between output terminals: 750V AC, 1 minute			
Weight (approx.)	Projector: 115g, Receiver: 130g	130g		

DC Power Models

Sensing Method	Through-Beam	Polarized Retroreflective	Diffuse-Reflective	Background Suppression
Part Number	SA1U-T50MW SA1U-T50MWT	SA1U-P07MW SA1U-P07MWT	SA1U-D01MW SA1U-D01MWT	SA1U-B02MW SA1U-B02MWT
Power Voltage	12 to 24V DC (10 to 30V DC) ripple rate 10% p-p maximum			
Current Draw	Projector: 20 mA maximum Receiver: 25 mA maximum	30 mA maximum		
Control Output	Type	NPN, PNP open collector (dual output)		
	Load Current	NPN: 100 mA maximum, PNP: 100 mA maximum		
	Applied Voltage	30V DC maximum		
	Voltage Drop	NPN: 2.4V maximum, PNP: 2.4V maximum		
Response Time	1 ms maximum			
Insulation Resistance	Between live and dead parts: 20 MΩ minimum (500V DC megger)			
Dielectric Strength	Between live and dead parts: 1000V AC, 1 minute			
Weight (approx.)	Projector: 105g, Receiver: 110g	110g		

Common Specifications

Sensing Method	Through-Beam	Polarized Retroreflective	Diffuse	Background Suppression
Sensing Distance	50m maximum	0.2 to 7m (when using supplied reflector IAC-R5)	1m maximum (200 × 200 mm white mat paper)	0.2 to 2m (200 × 200 mm white mat paper)
Preset Distance		—		0.4 to 2m (200 × 200 mm white mat paper)
Detectable Object	Opaque	Opaque/Mirror surface	Opaque/Transparent	Opaque
Hysteresis	—	—	20% of sensing distance max.	15% of sensing distance max.
Operation Mode	Light ON or Dark ON (mode selector)			
Control Output	[Projector] Power LED: Green [Receiver] Operation LED: Yellow Stable LED: Green	Operation LED: Yellow Stable LED: Green		Operation LED: Yellow
Light Emitting Element	Infrared LED (870 nm)	Red LED (660 nm)	Infrared LED (870 nm)	
Sensitivity Adjustment	1-turn control knob			8-turn control knob
Extraneous Light Immunity	Sunlight: 10,000 lux maximum, Incandescent lamp: 5,000 lux maximum			
Vibration Resistance	Damage limits: 10 to 55 Hz, amplitude 1.5 mm, 30 minutes in each axis			
Shock Resistance	Damage limits: 500 m/s ² , 3 shocks each in 6 axes 3 consecutive times			
Operating Temperature	-25 to +60°C (no freezing), storage temperature: -40 to +70°C			
Operating Humidity	35 to 85% RH (no condensation), storage humidity: 35 to 85% RH			
Connection Method	Terminal block with M3 spring-up screws			
Applicable Cable	Outside diameter ø8 to ø10 mm (core 0.3 to 0.75 mm ²)			
Cable Extension	Extendable up to 100m with a cabtyre cable of 0.3 mm ² minimum			
Housing Material	PBT (indicator cover: PC)			
Lens Material	PC/PET	PMMA	PC/PET	
Degree of Protection	IP67 (IEC/EN60529)			

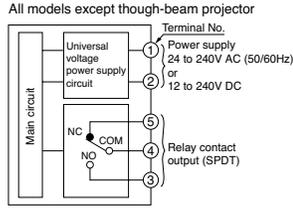
Time Delay Specifications

Sensing Method	Through-Beam	Polarized Retroreflective	Diffuse	Background Suppression
Type No.	SA1U-T50MT SA1U-T50MWT	SA1U-P07MT SA1U-P07MWT	SA1U-D01MT SA1U-D01MWT	SA1U-B02MT SA1U-B02MWT
Time Range	0.1 to 5.0 sec (adjusted with the 1-turn control knob)			
Time Delay Function	One shot, ON delay, OFF delay, and normal (no delay limit operation) modes			
Temperature Effect of Time Delay	±10% maximum of the time delay for 20°C temperature rise within the operating temperature range			
Repetitive Accuracy of Time Delay	±1.0% maximum of the time delay for repetitive inputs at 10 seconds or more			

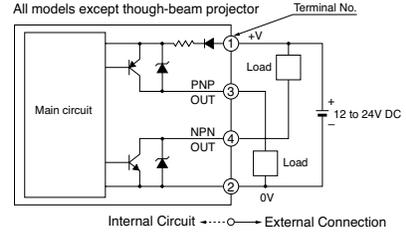
Descriptions

Output Circuit / Connection Diagram

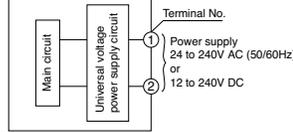
[Universal Voltage Type]



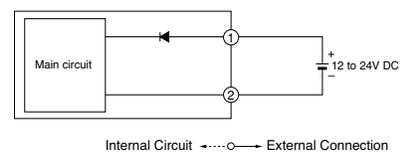
[DC Power Type]



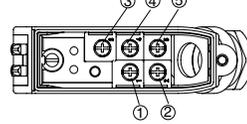
Though-beam projector



Though-beam projector

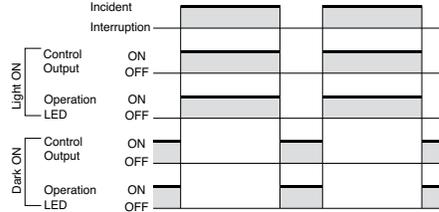


Terminal Arrangement

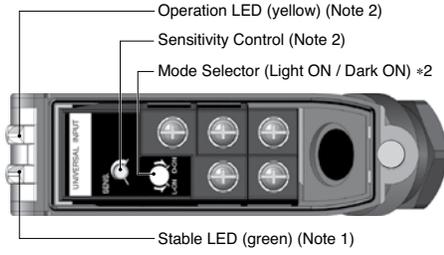


*Terminal 5 not available on DC power types.

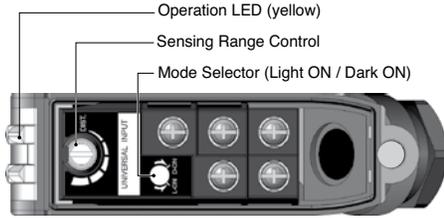
Operation Chart



Part Numbers
SA1U-T50M*
SA1U-P07M*
SA1U-D01M*

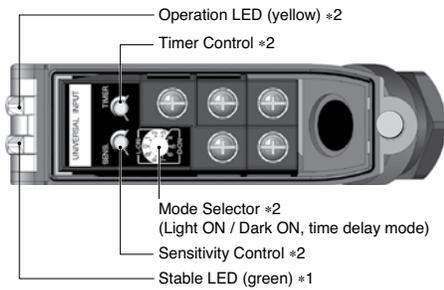


SA1U-B02M*

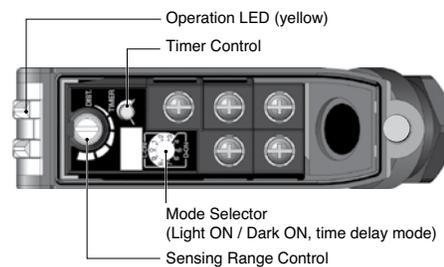


1. Power LED for through-beam projector
2. Not available on through-beam projector

Part Numbers
SA1U-T50M*T
SA1U-P07M*T
SA1U-D01M*T



SA1U-B02M*T



1. Power LED for through-beam projector
2. Not available on through-beam projector

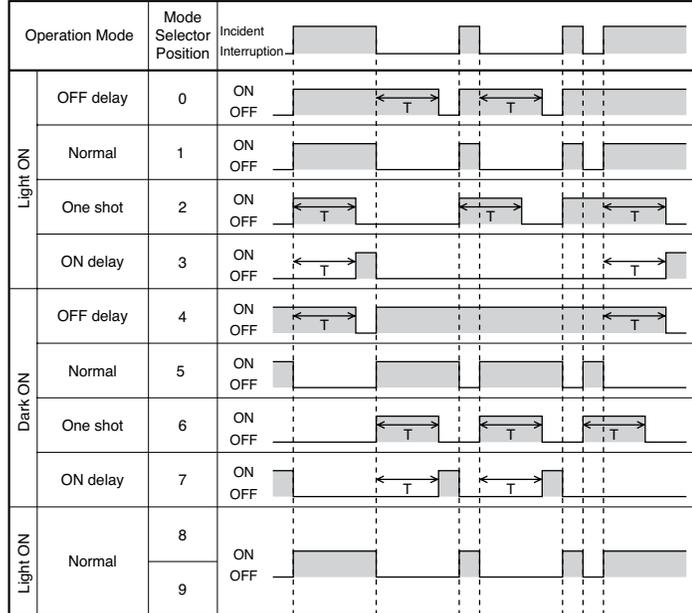
Output Circuit / Connection Diagram

See the "Output Circuit / Connection Diagram" diagram above.

Terminal Arrangement

See the "Terminal Arrangement" diagram above.

Operation Chart



OT Touchscreens

PLCs

Automation Software

Power Supplies

Sensors

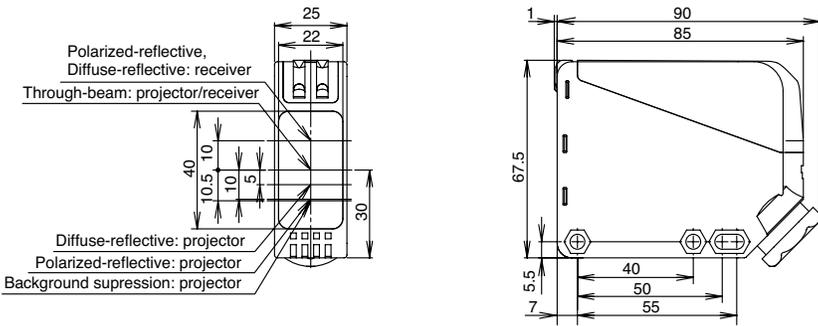
Communication

Barriers

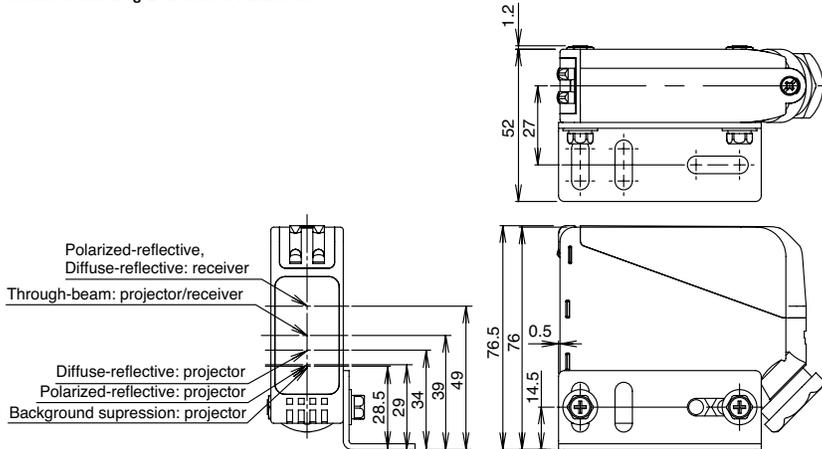
Without Time Delay

Without Time Delay

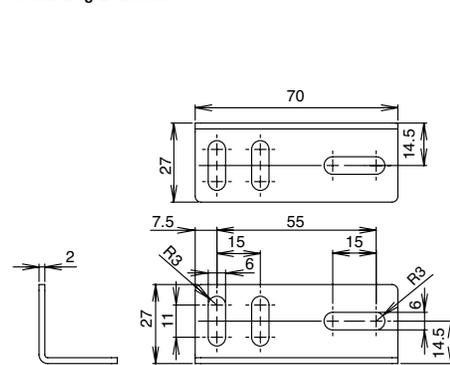
Dimensions (mm)



When Mounting Bracket is Attached



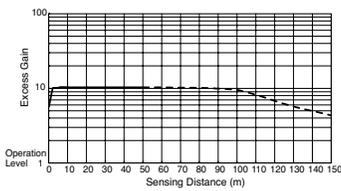
Mounting Bracket



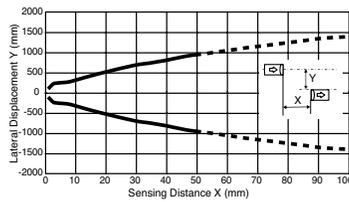
Characteristics (Typical)

Through-beam SA1U-T50M

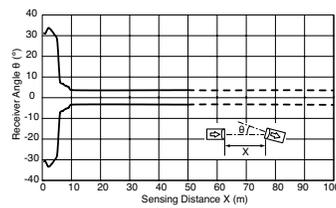
Excess Gain (transparency 1% ND filter is used)



Lateral Displacement (transparency 2.8% ND filter is used)



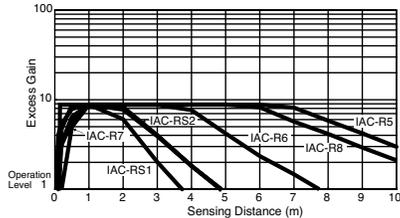
Angle



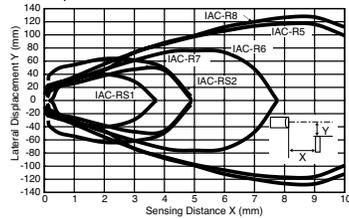
Polarized Retroreflective

SA1U-P07M*

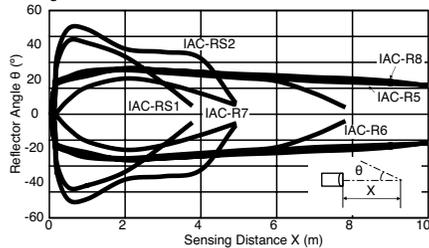
Excess Gain



Lateral Displacement



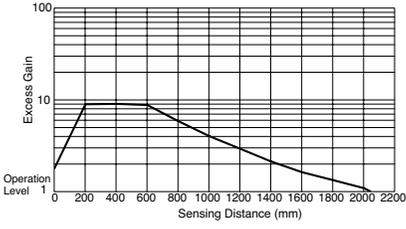
Angle



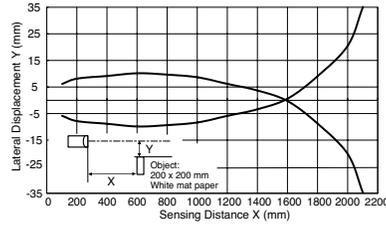
Characteristics (Typical)

Diffuse SA1U-D01M*

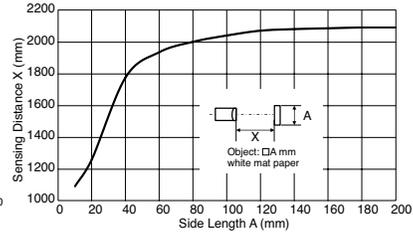
Excess Gain



Lateral Displacement



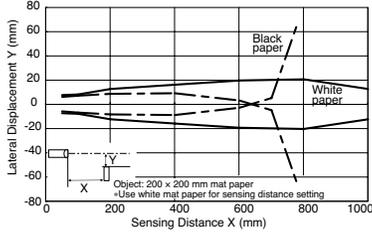
Object Size vs. Sensing Distance



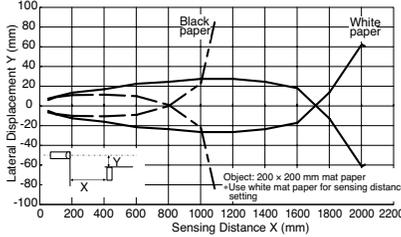
Background Suppression

SA1U-B02M*

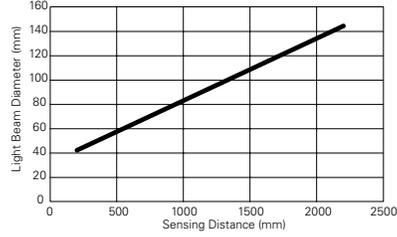
Lateral Displacement (preset 1m)



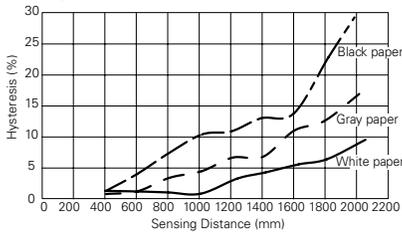
Lateral Displacement (preset 2m)



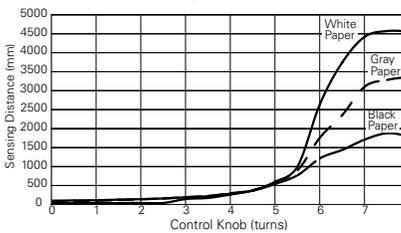
Light Beam Diameter



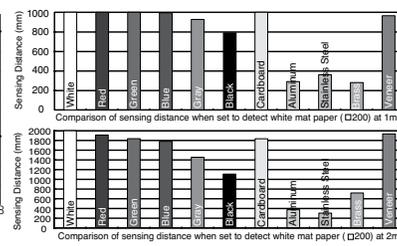
Sensing Distance vs. Hysteresis



Control Knob vs. Sensing Distance



Color Mat Paper and Other Materials



OI Touchscreens

PLCs

Automation Software

Power Supplies

Sensors

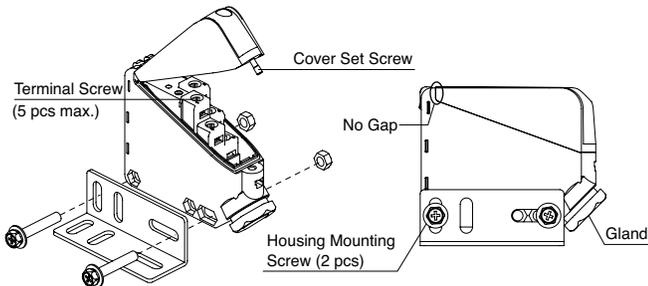
Communication

Barriers

Instructions

Installation

Make sure that there are no gaps between the cover and the housing as shown in the diagram below.



To maintain waterproof characteristics, tighten the screws within the range of the recommended tightening torque.

Excessive tightening may cause damage.

Screw Tightening Torque

Screw	Recommended Tightening Torque (N·m)
Terminal screw	0.6 to 1.0
Gland	4.0 to 6.0
Cover set screw	0.5 to 0.8
Housing mounting screw	0.8 to 1.2

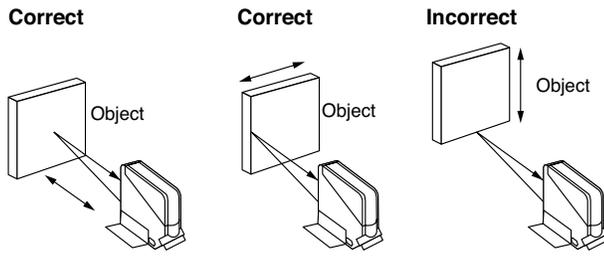
Notes

- When installing photoelectric switches, take into consideration the reflecting light from the floor or walls as it may affect sensing of through-beam and background suppression types.
- Make sure to prevent sunlight, fluorescent light, and fluorescent light of inverters from entering the receiver of the photoelectric switch directly. Keep the through-beam type receiver away from intense extraneous light.

- When installing SA1U photoelectric switches, do not tighten the mounting screws excessively or hit the switch with a hammer, otherwise the protection degree cannot be maintained.
- Make sure that the supply voltage is within the rated values.
- When using a switching regulator, be sure to ground the FG (frame ground) terminal.
- To suppress a transient state at start-up, a circuit to turn off the output is installed (universal voltage type: 50 ms, DC power type: 100 ms). The timer will start after resetting the off output.
- To meet European Union Low Voltage Directives, install an EN approved fuse on the outside of the power terminal or output terminal of the universal voltage type SA1U photoelectric switches.
- Attach the cover properly to maintain waterproof characteristics.
- Interference prevention allows two SA1U photoelectric switches to be mounted in close proximity. However, the through-beam type is not equipped with interference prevention. Maintain appropriate distance between the switches referring to the lateral displacement characteristics on pages 191 and 192.
- Polycarbonate or acrylic resins are used for optical elements. Do not use ammonia or caustic soda for cleaning, otherwise optical elements will dissolve. To remove dust and moisture build-up, use soft dry cloth.
- When mounting the reflector, do not tighten the mounting screws excessively, otherwise the screw hole of the reflector may be damaged.
- Use M4 mounting screws for the IAC-R5 and IAC-R8 reflectors and M3 mounting screws for the IAC-R6 reflector. Tighten the mounting screws to a tightening torque of 0.5 N·m maximum.
- 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. 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.
- IAC-RS1 and IAC-RS2 reflectors 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 surface to ensure secure attachment.

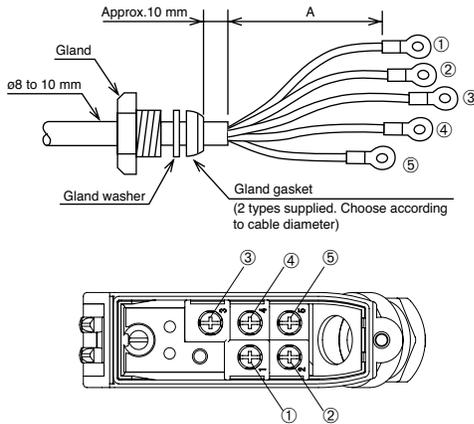
Installing the Background Suppression (BGS) Model

Install the sensor head as shown below to minimize sensing errors.



Wiring

Connecting Cables

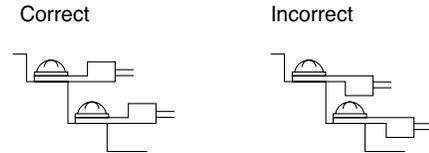


Recommended insulation length (A)

Terminal No.	①	②	③	④	⑤
Length "A" (mm)	45	30	55	40	25

- Connect the cables to the correct terminal number. Connect the lower terminal screws first.
- Attach the cover and secure with the set screw.
To maintain waterproof and dustproof characteristics, use cable glands (do not use soft cables as they may fall out) with $\varnothing 8$ to $\varnothing 10$ mm diameter. Install the attached gland gasket and washer and tighten the gland securely. For the small gland gasket, use a cable with $\varnothing 8$ to $\varnothing 10$ mm diameter. For the large gland gasket, use a cable with $\varnothing 9$ to $\varnothing 10$ mm diameter. The cable sheath should be 10 mm approx. Make sure that the gland washer fits in the groove of the gasket.
- When wiring, make sure that the power is turned off.
- Incorrect wiring may cause damage to the internal circuit.
- Avoid parallel wiring with high-voltage or power lines (especially inverters) in the same conduit, otherwise noise may cause malfunction and damage.
- When wiring is long or may be affected by power lines, use a separate conduit for wiring.
- Use a cable of 0.3 mm² minimum core wires. The cable can be extended up to 100m. For DC power types, voltage drop due to resistance of the cable lead wire should be taken into consideration.

- When using crimp terminals, make sure that the terminals do not come into contact with adjacent terminals. For correct installation, see the figure below.



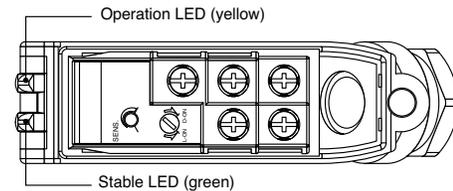
Dimension of Applicable Crimping Terminals

Ring Terminal	Spade Terminal

Dimensions in mm.

- When using insulation for ring terminals, use an insulating sheath.
- Install the insulation sheath to the crimp part before wiring.
- Only one crimp terminal can be connected per terminal.

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 use the SA1U photoelectric switch after the stable LED is on.

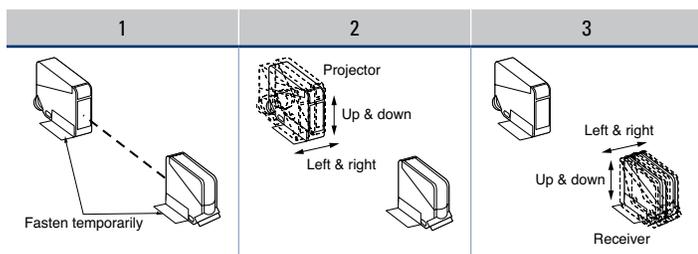
See the table below.

Light Receiving Status	Stable LED (green)	Operation LED (yellow)/ Control Output	
		Light ON	Dark ON
Stable Incident	ON	ON	OFF
Unstable Incident	OFF	OFF	ON
Unstable Interruption	OFF	OFF	ON
Stable Interruption	ON	OFF	ON

Optical Axis Alignment (Light ON)

1. Through-Beam Type

Fasten the receiver temporarily. Place the projector facing 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.



Sensitivity Adjustment (except Background Suppression)

- Referring to the table below, adjust the sensitivity of the SA1U photoelectric switch when necessary, such as when 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.
- Sensitivity is set to the maximum at the factory before shipment. When adjusting the sensitivity, use the screwdriver supplied with the SA1U photoelectric switch to turn the control as shown below, to a torque of 0.03 N·m maximum.

Step	Photoelectric Switch Status	Sensitivity Control	Adjusting Procedure
1	Receiving light Through-beam, polarized reflective: No object detected Diffuse reflective: Object detected		Turn the control counterclockwise to the minimum. Then turn clockwise until the operation LED turns on (turns off with dark ON type) (point A).
2	Light is interrupted Through-beam, polarized reflective: Object detected Diffuse reflective: 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.

2. Polarized Retroreflective

Install the reflector perpendicularly to the optical axis. Move the SA1U 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.

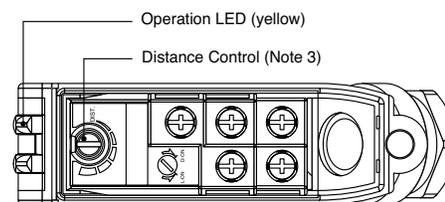
3. Diffuse-Reflective

Place the SA1U photoelectric switch where the switch can detect an 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.

Adjustment of Sensing Range for Background Suppression

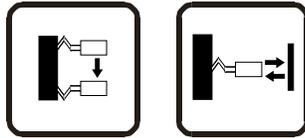
When adjusting the sensing range, follow the instruction below.

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). ¹
3		Set the middle point between point A and B as point C. ²



- When the background distance is too far and not detected, turn the control 360°, and set the point as point C.
- Because the control is multi-turn, it may take more than one turn to move from point A to point B.
- Turning the control clockwise lengthens the sensing distance.
- Background suppression (BGS) type is not provided with a stable LED.

Fiber Optic Analog: SA1C-FK

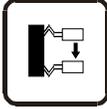
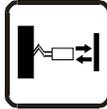
**Key features:**

- High-speed, miniature photoelectric sensors with analog (4 - 20mA) and digital output
- Senses gradual color changes
- Available in red or green LEDs
- Through-beam and reflected-light sensing available
- Ideal for either color mark applications or simple presence and absence applications requiring analog output
- Compact size allows for DIN rail mounting
- Fiber optic units available to address specific application needs
- Simple to install
- IP66 protection rating

Built on the foundation of SA1C-F, SA1C-FK is ideal for either color mark applications or simple presence and absence applications requiring analog output.

Featuring analog and digital output, this sensor comes in through-beam or reflected-light sensing styles.

Part Numbers

Function	Light Source Element	Output	Part Number
 	Red LED	Analog output + NPN output	SA1C-FK3
	Green LED		SA1C-FK3G

For information on accessories, see page 203.



Function is determined by the fiber optic unit used.

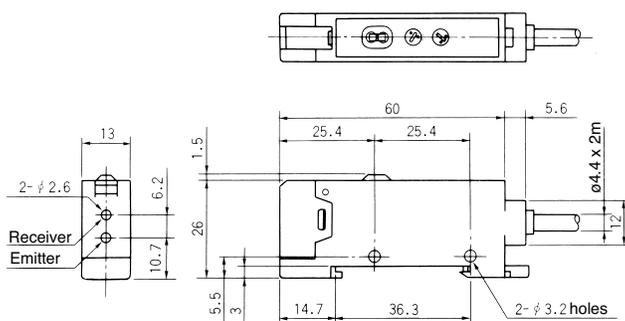
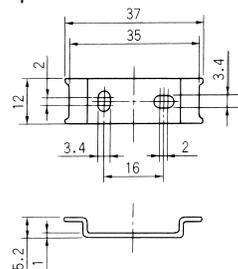
Specifications

		SA1C-FK3	SA1C-FK3G
Light Source Element	Red LED	√	—
	Green LED	—	√
Sensing Distance	Depends on the fiber unit (see page 204)	√	√
Power Voltage	12 to 24V DC (Operating voltage: 10 to 30V DC) ripple 10% maximum	√	√
Current Draw	80mA maximum	√	√
Analog Current Output	4 to 20mA, 5V DC maximum ¹	√	√
Digital Output	NPN open collector 30V DC, 100mA maximum, 1.5V maximum with short circuit protection	√	√
Operation Mode	Dark ON (connect MODE line to GND line)	√	√
	Light ON (connect MODE line to power line)	√	√
Response	0.5ms maximum ²	√	√
Indicator	Operation LED: Red, Stable LED: Green	√	√
Detectable Object	Translucent object, opaque object	√	√
Hysteresis	20% maximum (using reflex fiber unit)	√	√
Sensitivity	4-turn adjustment	√	√
Operation Point Control	1 turn	√	√
Receiver Element	Photo diode	√	√
Operating Temperature	–25 to +55°C (performance will be adversely affected if the sensor becomes coated with ice)	√	√
Storage Temperature	–30 to +70°C (performance will be adversely affected if the sensor becomes coated with ice)	√	√
Operating Humidity	35 to 85% RH (avoid condensation)	√	√
Extraneous Light Immunity	Sunlight: 10,000 lux maximum; Incandescent light: 3,000 lux (at the receiver)	√	√
Noise Resistance	Normal mode: 500V (50ns to 1μs, 100Hz: Using a noise simulator)	√	√
	Common mode: 300V (50ns to 1μs, 100Hz: Using a noise simulator)	√	√
Insulation Resistance	Between live and dead parts: 20MΩ minimum, with 500V DC megger	√	√
Dielectric Strength	Between live and dead parts: 1,000V, 1 minute	√	√
Vibration Resistance	Damage limits: 10 to 55Hz; Single amplitude: 0.75mm 20 cycles in each of 3 axes	√	√
Shock Resistance	Damage limits: 500 m/sec ² 10 cycles in each of 3 axes	√	√
Degree of Protection	IP66—IEC Pub 529	√	√
Cable	Ø4.4mm 5-core vinyl cabtyre cable 0.2mm ² , 6'–6-3/4" (2m) long	√	√
Material	Housing: PBT	√	√
Accessories	Mounting bracket, adjusting screwdriver, load resistor (249Ω) for converting analog amperage to voltage (1 to 5V)	√	√
Interference Prevention	Up to 2 units can be installed in close proximity. For analog output, interference prevention is not possible.	√	√
Weight	Approximately 75g	√	√

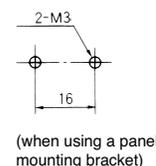


1. Analog current output specification is based on the power voltage range from 12 to 24V DC (±10%). Use the attached resistor (249Ω, 1/4W) as a load resistance for converting analog output to voltage.
2. Response time for analog current output is between 10% and 90% of the rise or fall of the voltage signal when using a 249Ω resistor.

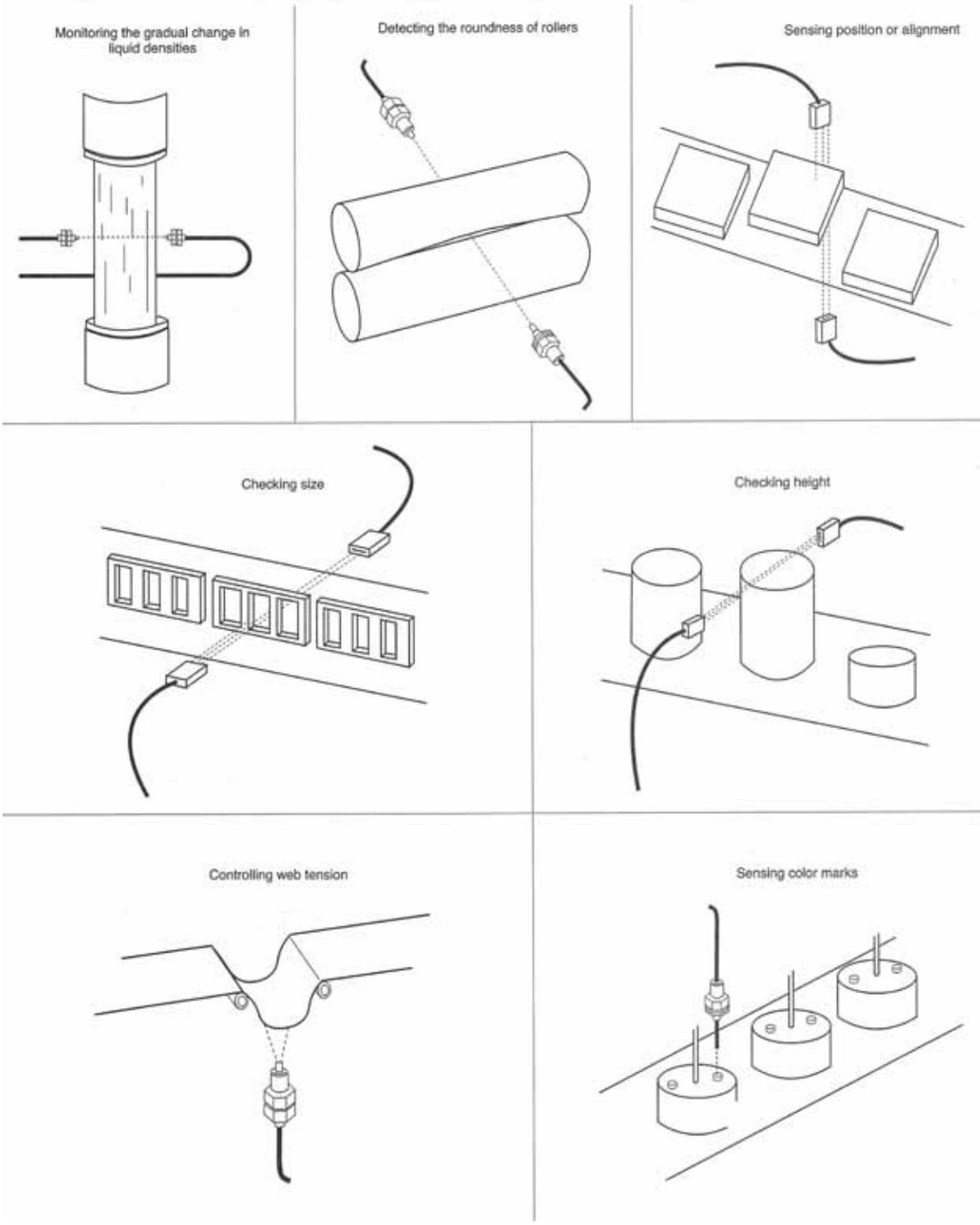
Dimensions (mm)

Panel Mounting Bracket (attachment)
Not required for DIN Rail mounting

Mounting Hole Layout



Applications



01 Touchscreens

PLCs

Automation Software

Power Supplies

Sensors

Communication

Barriers

High-speed Fiber Optic: SA1C-F



Key features:

- Ideal for remote sensing applications
- Featuring quick-connect cable and easy-insert fiber optic units for simple installation
- Through-beam and reflected-light sensing available
- Sensing range up to 7.09" (180mm) for through-beam sensors
- Dual outputs: Select NPN and PNP transistor outputs or NPN transistor output combined with a self-diagnostic output
- Outputs selectable for light on or dark on
- High-speed, 50 μ s response time
- Featuring variable off-delay (0 to 100msec) and fine-tune sensitivity adjustment
- Stable LED makes alignment easy
- Red or green LEDs available for detecting color marks
- Mount on a 35mm DIN rail



The perfect fiber optic sensor for applications where you have difficulty mounting regular or miniature sensors or where accessibility is a problem.

Available in through-beam and retro-reflective models, the built-in variable off-delay (0 - 10ms) can help you bring your complete system in tune.

The 50 μ s response time ensures detection of fast moving targets in a high-speed manufacturing environment where speed counts.

Part Numbers

Function	Amplifier	Output	Light Source	Response	Through-Beam Units		Diffuse-Reflected Units	
					Part Number	Range	Part Number	Range
OI Touchscreens	SA1C-FN3E (Cable) SA1C-FN3EC (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) Self-diagnostic: 50mA (maximum)	Red LED	Standard speed: 0.5 ms	SA9F-TS: ϕ 0.16" (M4) Straight	180mm (7.09")	SA9F-DS: ϕ 0.24" (M6) Straight	60mm (2.36")
		SA9F-TC: ϕ 0.16" (M4) Coiled			150mm (5.91")	SA9F-DC: ϕ 0.24" (M6) Coiled	25mm (0.98")	
PLCs	SA1C-FD3F (Cable) SA1C-FD3FC (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) PNP transistor: 200mA (maximum)	Red LED	Standard speed: 0.5 ms	SA9F-TT: ϕ 0.12" (M3) Straight	50mm (1.97")	SA9F-DD: ϕ 0.24" (M6) Coaxial	60mm (2.36")
		SA9F-TM: ϕ 0.16" (M4) Multicore			150mm (5.91")	SA9F-DT: ϕ 0.12" (M3) Straight	20mm (0.79")	
Automation Software	SA1C-FN3EG (Cable) SA1C-FN3EGC (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) Self-diagnostic: 50mA (maximum)	Green LED	Standard speed: 0.5 ms	SA9F-TS: ϕ 0.16" (M4) Straight	16mm (0.63")	SA9F-DS: ϕ 0.24" (M6) Straight	7mm (0.28")
		SA9F-TC: ϕ 0.16" (M4) Coiled			14mm (0.55")	SA9F-DC: ϕ 0.24" Incompatible with green LED	N/A	
Power Supplies	SA1C-FD3FG (Cable) SA1C-FD3FGC (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) PNP transistor: 200mA (maximum)	Green LED	Standard speed: 0.5 ms	SA9F-TT: ϕ 0.12" (M3) Straight	5mm (0.20")	SA9F-DD: ϕ 0.24" (M6) Coaxial	7mm (0.28")
		SA9F-TM: ϕ 0.16" (M4) Multicore			14mm (0.55")	SA9F-DT: ϕ 0.12" Incompatible with green LED	N/A	
Sensors	SA1C-F1N3E (Cable) SA1C-F1N3EC (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) Self-diagnostic: 50mA (maximum)	Red LED	High- speed: 50 μ s	SA9F-TT: ϕ 0.12" (M3) Straight	15mm (0.59")	SA9F-DS: ϕ 0.24" (M6) Coaxial	20mm (0.79")
		SA9F-TM: ϕ 0.16" (M4) Multicore			40mm (1.57")	SA9F-DT: ϕ 0.12" (M3) Straight	6mm (0.24")	
	SA1C-F1D3F (Cable) SA1C-F1D3FC (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) PNP transistor: 200mA (maximum)	Red LED	High- speed: 50 μ s	SA9F-TT: ϕ 0.12" (M3) Straight	15mm (0.59")	SA9F-DS: ϕ 0.24" (M6) Coaxial	20mm (0.79")
		SA9F-TM: ϕ 0.16" (M4) Multicore			40mm (1.57")	SA9F-DT: ϕ 0.12" (M3) Straight	6mm (0.24")	
					SA9F-TM: ϕ 0.16" (M4) Multicore	30mm (1.18")	SA9F-DM: ϕ 0.01" (0.26mm) Multicore	18mm (0.71")
					SA9F-TH: Heat-resistant glass fiber		SA9F-DH: Heat-resistant glass fiber	7mm (0.28")
					SA9F-TL: Side view	13mm (0.51")	SA9F-DL: Heat-resistant glass fiber Side view	3mm (0.12")



Function is determined by the fiber optic unit used.

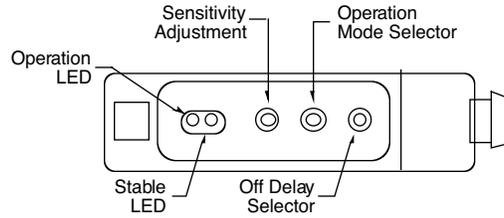
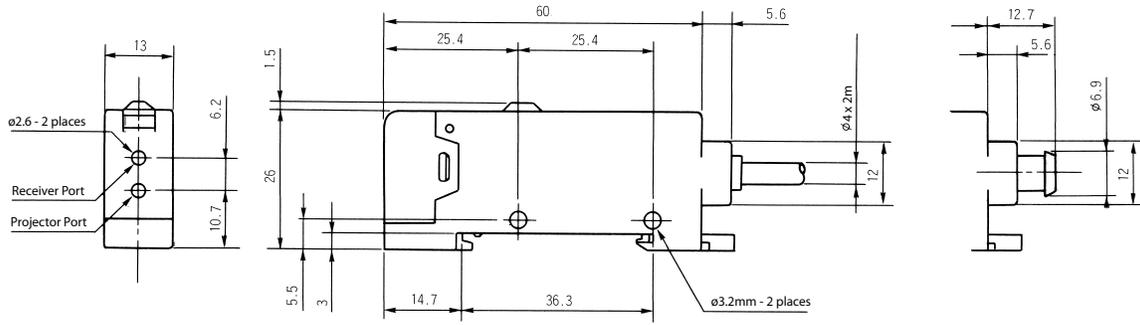
For information on accessories, see page 203.

Specifications

		SA1C-FN, -FD (Standard Speed)	SA1C-F1N, -F1D (High-speed)	
General Specifications	Power Voltage	12V to 24V DC	√	
	Operating Voltage	10V to 30V DC, ripple 10% (maximum)	√	
	Current Draw	30mA (maximum)	√	–
		40mA (maximum)	–	√
	Operating Temperature	Amplifier only: –25° to +55°C Fiber optic cords (except heat-resistant types): –40° to +70°C Heat-resistant fiber optic cords: –40°C to +350°C (avoid ice coating)	√	√
	Operating Humidity	35 to 85% RH (avoid condensation)	√	√
	Extraneous Light Immunity	Sunlight: 10,000 lux (maximum); Incandescent light: 3,000 lux (maximum) on receiver surface— defined as incident or unwanted light received by a sensor, unrelated to the presence or absence of the intended object	√	√
	Material	Amplifier only: PBT resin (housing) with polycarbonate lens Fiber optic cords (except heat-resistant types): Nickel-plated brass (sensing head), polyethylene-covered PMMA (cord), and SUS304 stainless (sleeve) Heat-resistant fiber optic cords: SUS 304 stainless (sensing head) and SUS spiral tube around glass fiber cord	√	√
	Degree of Protection	IP66 — IEC Pub 529, sensors rated IP66 are dust-tight, water-resistant, and perform best when not subjected to heavy particle or water blasts	√	√
	Connection	Cable type: 0.2mm ² ; Vinyl cabtyre cable #24 AWG, 6'–6-3/4' (2m) long Connector type: Ø 0.31" (8mm) 3- or 4-pin connector (cable ordered separately for quick connect sensors)	√	√
	Light Source	Red or green LED (pulse-modulated)	√	√
	Output	NPN transistor: 30V DC (1.2V residual), 100mA (maximum) PNP transistor: 30V DC (2.0V residual), 200mA (maximum) Self-diagnostic: 30V DC (1.2V residual), 50mA (maximum)	√	√
	Response	0.5ms (maximum)	√	–
		50µs (maximum)	–	√
Off Delay	0 to 100 ms (adjustable)	√	√	
Sensitivity	4-turn adjustment	√	√	
Minimum Bending Radius	Fiber optic cord (except SA9F-TT, -DT, -TL, and -DL): 1"R (25mm); Sleeve: 0.39"R (10mm) SA9F-TT and -DT: 0.59"R (15mm); Sleeve: 0.39"R (10mm) SA9F-TL and DL: 0.59"R (15mm); Sleeve: Unbendable	√	√	
Function Specifications	Operation Mode	Light on or dark on (selectable by switch on amplifier)	√	
	Indicator	Operation indicator: Red LED (out)	√	
		Stable level indicator: Green LED (stable)	√	
	Noise Resistance	Normal Mode	500V	√
			300V	–
		Common Mode	300V	√
	150V		–	
	Pulse Width	50ns –1µs, 100Hz (using a noise simulator)	√	
	Storage Temperature	–30 to +70°C (avoid freezing)	√	
	Insulation Resistance	20M minimum with 500V DC megger (between live & dead parts)	√	
Dielectric Strength	1000V, 1 minute (between live & dead parts)	√		
Vibration Resistance	Damage limits: 10 – 55Hz Amplitude: 1.5mm p-p, 20 cycles in each of 3 axes crossed (one cycle = 5 minutes)	√		
Shock Resistance	Damage limits: 500m/s ² (approximately 49G), 10 shocks in each of 3 axes	√		
Weight	Cable type: Approximately 75g Quick-connect type: Approximately 30g	√		



Dimensions (mm)



Detecting Color Marks

Color of Mark	Background Color										
	White	Yellow	Chartreuse	Orange	Red	Magenta	Turquoise	Blue	Violet	Green	Black
White	-	❖	◆	❖	❖	◆	◆	◆	◆	◆	◆
Yellow	❖	-	◆	❖	❖	❖	◆	◆	◆	◆	◆
Chartreuse	◆	◆	-	□	□	❖	□	◆	❖	◆	◆
Orange	❖	❖	□	-	-	❖	□	◆	◆	◆	◆
Red	❖	❖	□	-	-	□	□	◆	◆	◆	◆
Magenta	◆	❖	❖	❖	□	-	□	□	-	□	◆
Turquoise	◆	◆	□	□	□	□	-	□	◆	❖	◆
Blue	◆	◆	◆	◆	◆	□	□	-	□	□	□
Violet	◆	◆	❖	◆	◆	-	◆	□	-	□	□
Green	◆	◆	◆	◆	◆	□	❖	□	□	-	□
Black	◆	◆	◆	◆	◆	◆	◆	□	□	□	-

- = Use Red LED
- ❖ = Use Green LED
- ◆ = Use Red or Green LED
- = Not Detectable

OT Touchscreens

PLCs

Automation Software

Power Supplies

Sensors

Communication

Barriers

Accessories

Reflectors

Appearance	Item	Use with	Part Number	
	Standard reflector	SA1E	IAC-R5	
	Small reflector		IAC-R6	
	Large reflector		IAC-R8	
	Narrow (rear/side mounting)		IAC-R7M	
	Narrow (side mounting)		IAC-R7S	
	Narrow (rear mounting)		IAC-R7B	
	Tape (35 x 40mm)		IAC-RS1	
	Tape (70 x 80mm)		IAC-RS2	
	Standard		SA1E-X	IAC-R9
	Small			IAC-R10
	Ultra-small	IAC-R11		

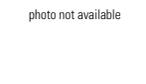
Brackets

Appearance	Item	Use with	Part Number	
	Vertical mounting bracket	SA1E	SA9Z-K01	
	Horizontal mounting bracket		SA9Z-K02	
	Cover mounting bracket		SA9Z-K03	
	Back mounting bracket		SA9Z-K04	
	Reflector mounting bracket		IAC-L2	
	Reflector mounting bracket		IAC-L3	
	Reflector mounting bracket		IAC-L5	
	Reflector mounting bracket			
	Reflector mounting bracket			
	Reflector mounting bracket			

Slits

Appearance	Item	Slit Size	Use with	Part Number	Min. Order Qty
	Vertical slit	0.5mm x 18mm	SA1E	SA9Z-S06	2
		1.0mm x 18mm		SA9Z-S07	
		2.0mm x 18mm		SA9Z-S08	
	Horizontal slit	0.5mm x 6.5mm		SA9Z-S09	
		1.0mm x 6.5mm		SA9Z-S10	
		2.0mm x 6.5mm		SA9Z-S11	
		ø0.5mm		SA9Z-S12	
	Round slit	ø1.0mm		SA9Z-S13	
		ø2.0mm		SA9Z-S14	

Connector Cables (for connector model sensors)

Appearance	Number of Core Wires	Type & Length	Use with	Part No.
	4	Straight, 2m	SA1E	SA9Z-CM8K-4S2
		Straight, 5m		SA9Z-CM8K-4S5
		Right angle, 2m		SA9Z-CM8K-4L2
		Right angle, 5m		SA9Z-CM8K-4L5
	4	2m	SA1C-F	SA9C-CA4D2
		5m		SA9C-CA4D5
		2m		SA9C-CA4D2S
		5m		SA9C-CA4D5S

Air Blower Mounting Blocks

Appearance	Item	Use with	Part Number
	Air blower mounting block	SA1E	SA9Z-A02

Sensitivity Control Screwdriver

Item	Part No.	Package Quantity
	SA9Z-AD01	1

Diffuse-Reflected Light Fiber Optic Units - SA9F

Appearance	Part Number	Description	Use with	Range
	<p>SA9F-DS31 No sleeve</p> <p>SA9F-DS32 3.54" (90mm) sleeve</p> <p>SA9F-DS33 1.77" (45mm) sleeve</p>	<p>Straight: Two fibers ø1mm (0.04")</p> <p>Threaded mount: ø6mm (M6)</p> <p>Detects: ø0.03mm (0.0012") minimum object</p>	<p>SA1C-FK3 SA1C-FK3G SA1C-F</p>	<p>60mm (2.36") 7mm (0.28")</p>
	<p>SA9F-DC31 No sleeve</p> <p>SA9F-DC32 3.54" (90mm) sleeve</p> <p>SA9F-DC33 1.77" (45mm) sleeve (All three not compatible with green LED)</p>	<p>Coiled: Two fibers ø1mm (0.04")</p> <p>Threaded mount: ø6mm (M6)</p> <p>Detects: ø0.03mm (0.0012") minimum object</p>	<p>SA1C-FK3 SA1C-FK3G SA1C-F</p>	<p>25mm (0.98") —</p>
	<p>SA9F-DT11 No sleeve</p> <p>SA9F-DT12 3.54" (90mm) sleeve</p> <p>SA9F-DT13 1.77" (45mm) sleeve (All three not compatible with green LED)</p>	<p>Straight: Two fibers ø0.5mm (0.02")</p> <p>Threaded mount: ø3mm (M3)</p> <p>Detects: ø0.03mm (0.0012") minimum object</p>	<p>SA1C-FK3 SA1C-FK3G SA1C-F</p>	<p>20mm (0.78") —</p>
	<p>SA9F-DD31</p>	<p>Coaxial: Core ø1mm (0.04") + 16 fibers: ø0.26mm (0.01")</p> <p>Threaded mount: ø6mm (M6)</p> <p>Detects: ø0.03mm (0.0012") minimum object</p>	<p>SA1C-FK3 SA1C-FK3G SA1C-F</p>	<p>60mm (2.36") 7mm (0.28")</p>
	<p>SA9F-DM74 1 row = 32 fibers</p> <p>SA9F-DM75 2 rows = 16 each (Not compatible with green LED)</p>	<p>Multicore: 32 fibers ø0.26mm (0.010")</p> <p>Detects: ø0.06mm (0.0024") minimum object</p>	<p>SA1C-FK SA1C-FK3G SA1C-F <small>(not compatible with SA9F-DM75, SA9F-DM76)</small></p>	<p>60mm (2.36") 4mm (0.16")</p>
	<p>SA9F-DH21 No sleeve</p> <p>SA9F-DH22 3.54" (90mm) sleeve (Both not compatible with green LED)</p>	<p>Heat-resistant glass: Two fibers ø0.7mm (0.03")</p> <p>Threaded mount: ø4mm (M4)</p> <p>Detects: ø0.03mm (0.0012") minimum object</p>	<p>SA1C-FK3 SA1C-FK3G SA1C-F</p>	<p>27mm (1.06") —</p>

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Through-Beam Fiber Optic Units - SA9F

Appearance	Part Number	Description	Amplifier	Range
	SA9F-TS21 No sleeve SA9F-TS23 1.77" (45mm) sleeve	Straight fiber: ø1mm (0.04") Threaded mount: ø4mm (M4) Detects: ø0.3mm (0.012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	180mm (7.09") 16mm (0.63")
	SA9F-TC21 No sleeve	Coiled fiber: ø1mm (0.04") Threaded mount: ø4mm (M4) Detects: ø0.3mm (0.012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	150mm (5.91") 14mm (0.55")
	SA9F-TT11 No sleeve	Straight fiber: ø0.5mm (0.02") Threaded mount: ø3mm (M3) Detects: ø0.15mm (0.006") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	50mm (1.97") 5mm (0.2")
	SA9F-TM21 No sleeve SA9F-TM22 3.54" (90mm) sleeve SA9F-TM23 1.77" (45mm) sleeve 16 fibers (cluster)	Multicore: ø0.26mm (0.010") Threaded mount: ø4mm (M4) Detects: ø0.3mm (0.012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	150mm (5.91") 14mm (0.55")
	SA9F-TM74 16 fibers in one row	Multicore: 16 fibers (one row) ø0.26mm (0.010") Detects: ø0.06mm (0.0024") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	150mm (5.91") 14mm (0.55")
	SA9F-TH21 No sleeve SA9F-TH22 3.54" (90mm) sleeve	Heat-resistant glass fiber: ø1mm (0.04") Threaded mount: ø4mm (M4) Detects: ø0.3mm (0.012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	100mm (3.94") 8mm (0.31")

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Miscellaneous Accessories

Description	Use with		Part Number
Fiber cutter	All fiber units except heat resistant	HxLxD: 23x 45 x 8mm (0.91" x 1.77" x 0.31") Included with fiber units; order replacement only	SA9Z-F01
Set of 2 easy-insert adaptors	SA9F-TT, SA9F-TL, SA9F-DT, and SA9F-DL	ø2.2 x 24mm long (ø0.087" (OD) x 0.945") Included with applicable fiber optic units; order replacement set only	SA9Z-F02
Lens attachment for long-range detection of opaque objects, minimum size: Ø 0.14" (3.5mm)	SA1C-F through-beam fiber unit only	Sensing ranges: Standard speed red LED: SA9F-TS21: 1.3m (4' - 3-3/16") SA9F-TC21: 1m (3' - 3-3/8") 0.1m (3.94") SA9F-TM21: 1.05m (3' - 5-3/8")	SA9Z-F11
		Sensing ranges: Standard speed green LED: SA9F-TS21: 0.135m (5.31") SA9F-TC21: 0.1m (3.94") SA9F-TM21: 0.13m (5.12")	
		Sensing ranges: High-speed red LED: SA9F-TS21: 0.4m (5.75") SA9F-TC21: 0.3m (1.81") SA9F-TM21: 0.38m (4.96")	
Side view attachment to rotate axis by 90° for detection of opaque objects, minimum size: Ø 0.14" (3.5mm)	SA1C-F through-beam fiber unit only	Sensing ranges: Standard speed red LED: SA9F-TS21: 200mm (7.87") SA9F-TC21: 130mm (5.12") SA9F-TM21: 160mm (6.30")	SA9Z-F12
		Sensing ranges: High-speed red LED: SA9F-TS21: 50mm (1.97") SA9F-TC21: 35mm (1.38") SA9F-TM21: 40mm (1.57")	
Side-on attachment for narrow clearance, Range: 1.26" (32mm), for detection of transparent or opaque objects	SA1C-F diffuse-reflected light fiber unit only	Sensing ranges: Standard speed red LED: SA9F-TS21: 35mm (1.38") SA9F-TC21: 30mm (1.81") SA9F-TM21: 35mm (1.38")	SA9Z-F13
Attachment for high-accuracy: Range: 0.4" ± 0.04" (10mm ± 1mm), for detection of transparent or opaque objects	SA1C-F through-beam fiber unit only	Sensing ranges: Standard speed red LED:	SA9Z-F14
		SA9F-TS21: 10mm ± 1mm	
		SA9F-TC21: (0.394" ± 0.039") SA9F-TM21:	

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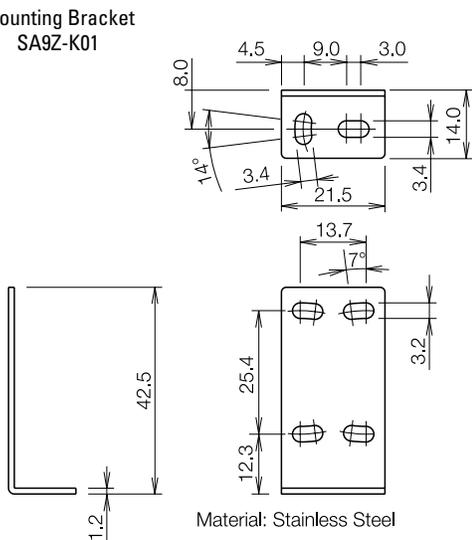
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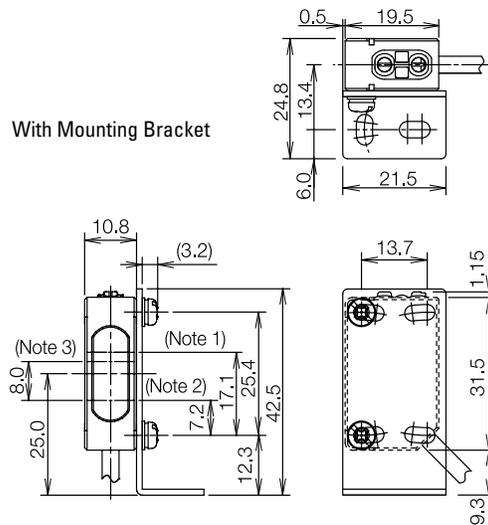
Accessory Dimensions (mm)

Mounting Bracket
SA9Z-K01



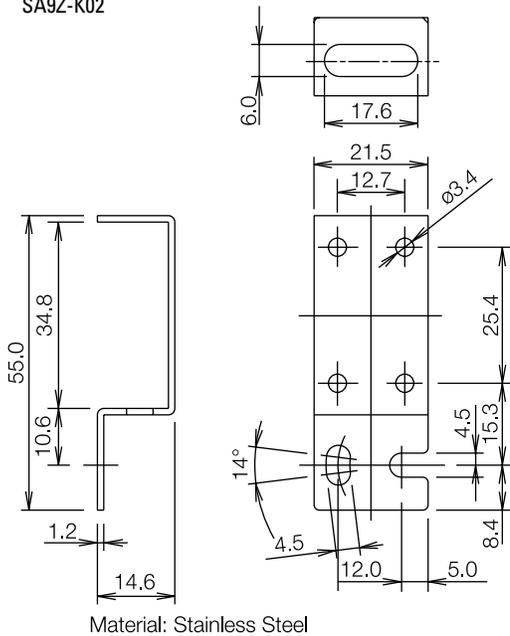
Material: Stainless Steel

With Mounting Bracket



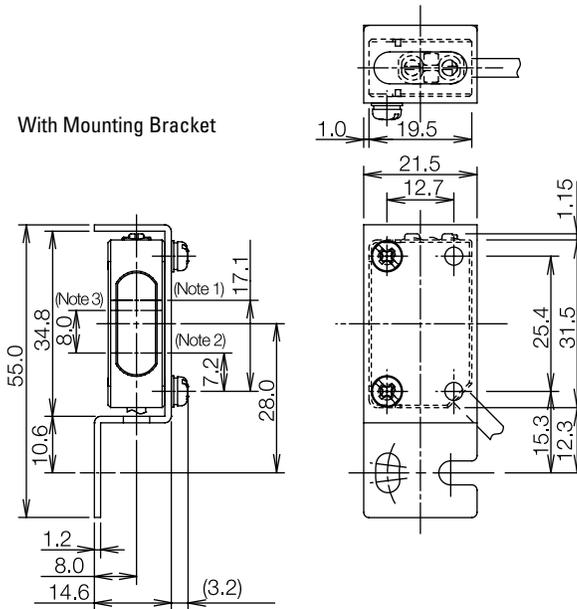
Note 1: Projector (through-beam)Receiver (through-beam)
 Note 2: Projector (polarized retroreflective, background suppression)
 Note 3: Receiver (polarized retroreflective)

SA9Z-K02



Material: Stainless Steel

With Mounting Bracket



Note 1: Projector (through-beam)Receiver (through-beam)
 Note 2: Projector (polarized retroreflective, background suppression)
 Note 3: Receiver (polarized retroreflective)

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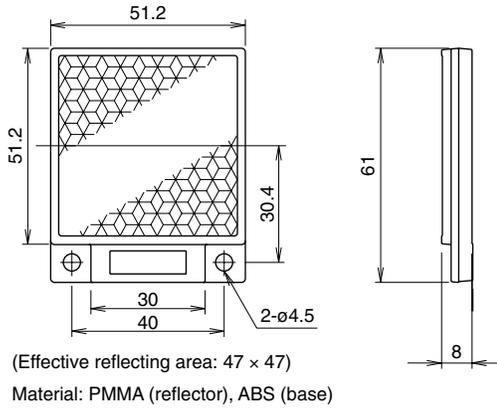
Power Supplies

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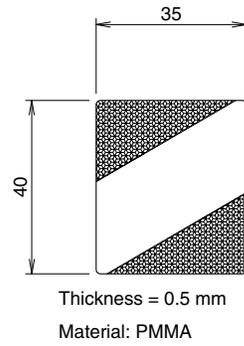
Communication

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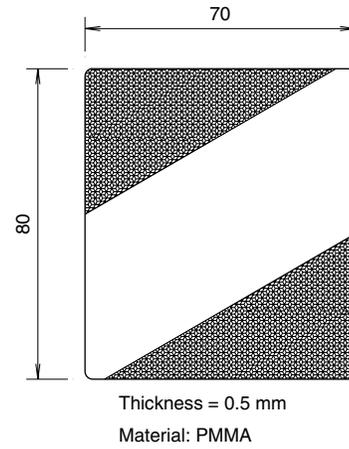
Reflector
IAC-R8



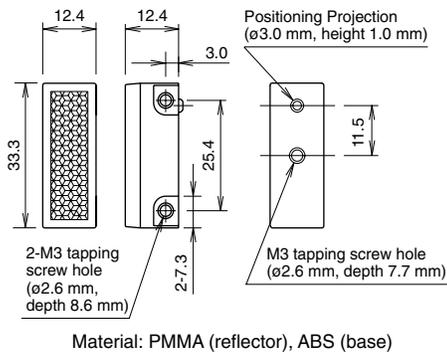
IAC-RS1



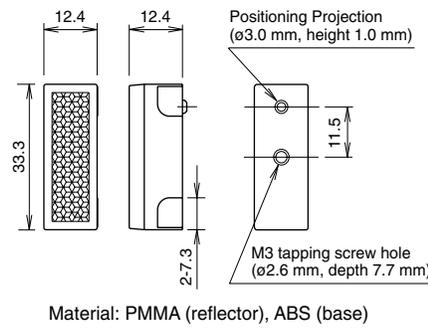
IAC-RS2



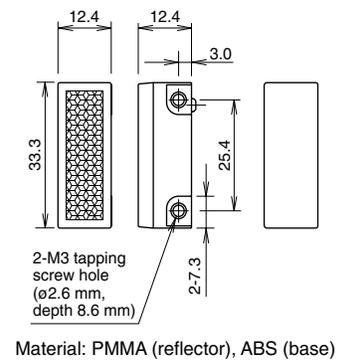
IAC-R7M (rear/side mounting)



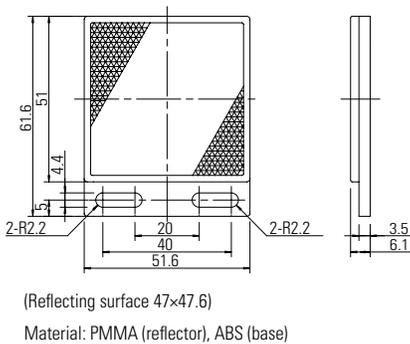
IAC-R7B (rear mounting)



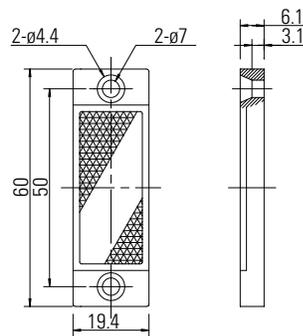
IAC-R7S (side mounting)



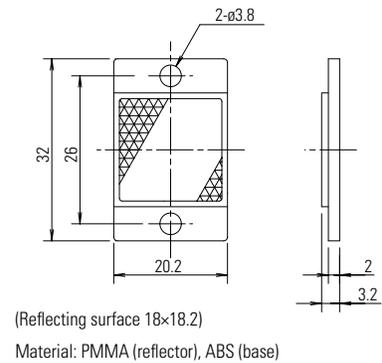
IAC-R9



IAC-R10



IAC-R11



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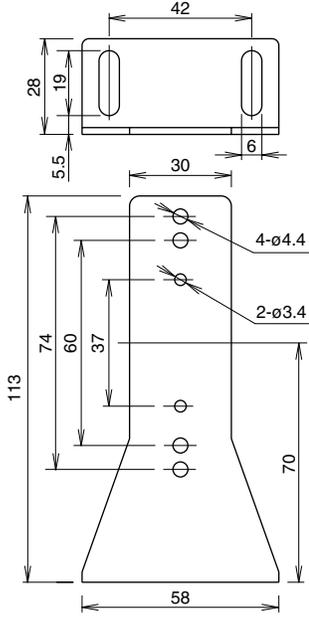
Power Supplies

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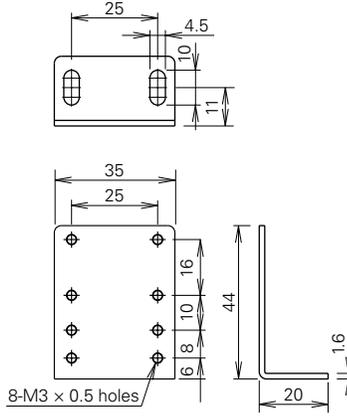
Barriers

Reflector Mounting Bracket
IAC-L2 (for IAC-R5)



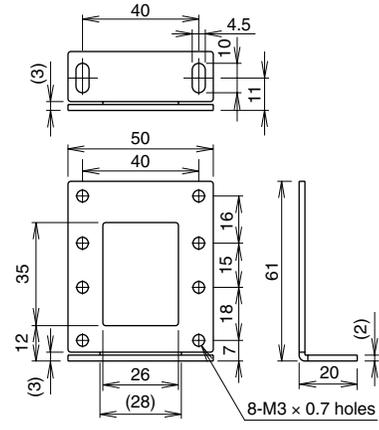
Material: SPCC (zinc chromate plating, black)

IAC-L3 (for IAC-R6)



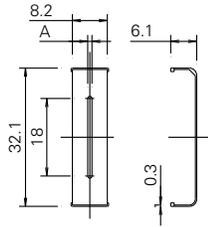
Material: SPCC (zinc plating)

IAC-L5 (for IAC-R8)



Material: SPCC (zinc plating)

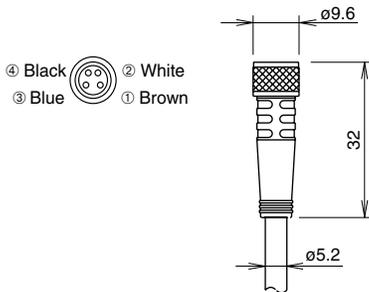
Slit (Vertical Slit)
SA9ZS06, -S07, -S08



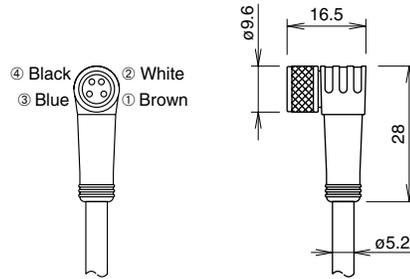
Material: Stainless Steel

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

Connector Cable (connector on one end)
Straight (SA9Z-CM8K-4S□)

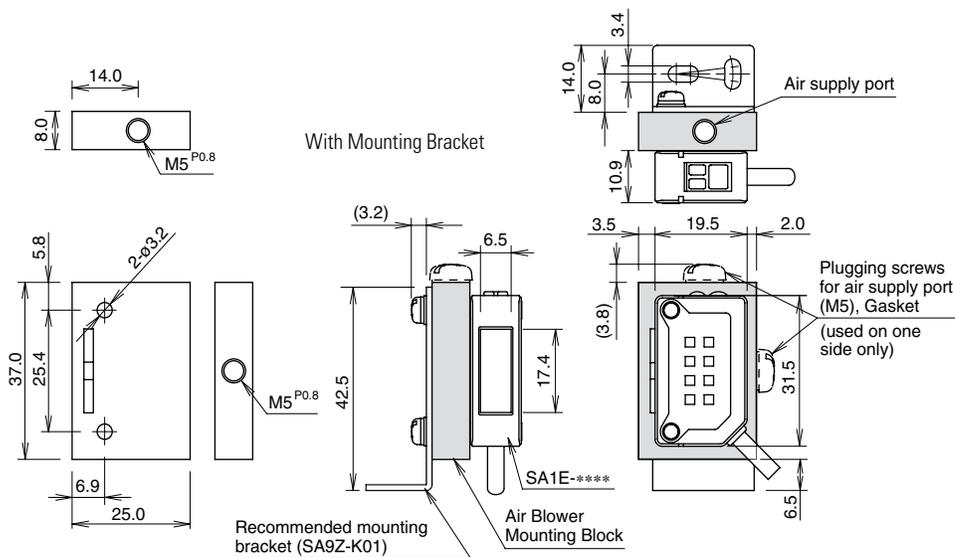


Right-angle (SA9Z-CM8K-4L□)



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

Air Blower Mounting Block

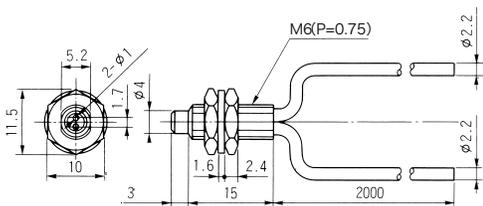


- The SA9Z-A02 air blower mounting block is supplied with two mounting screws (M3 × 20 mm sems screws), one screw for plugging the air supply port (M5 × 6 mm), and one gasket for plugging the air supply port.
- An air tube fitting (M5) can be installed to either the top or side. Tighten the fitting to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

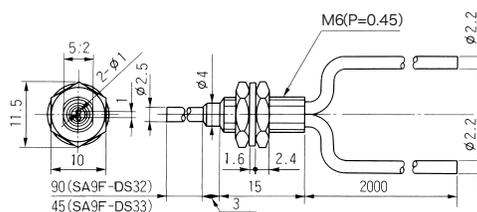
(Material: Anodized aluminum surface)

Diffuse-Reflective Light Fiber Optic Units

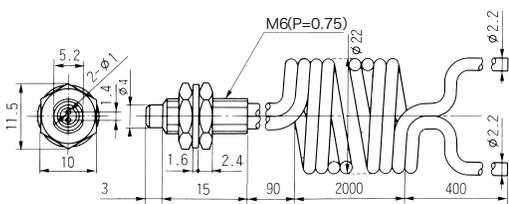
SA9F-DS31



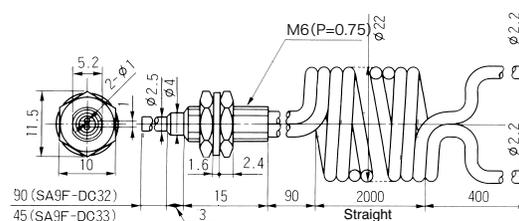
SA9F-DS32, SA9F-DS33



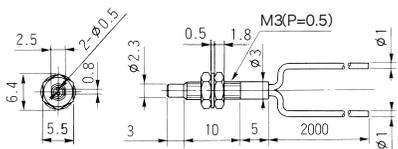
SA9F-DC31



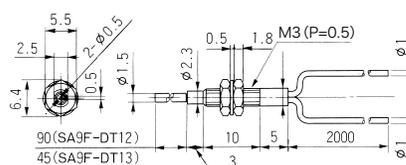
SA9F-DC32, SA9F-DC33



SA9F-DT11



SA9F-DT12, SA9F-DT13



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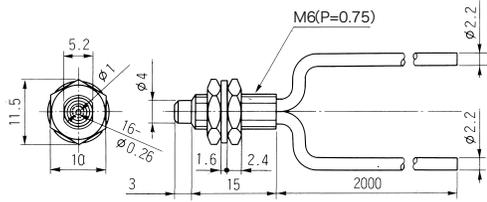
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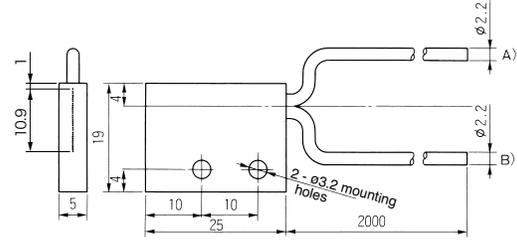
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Diffuse-Reflective Light Fiber Optic Units con't

SA9F-DD31

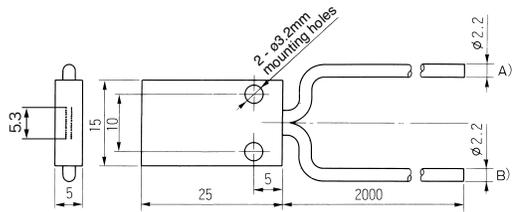


SA9F-DM74



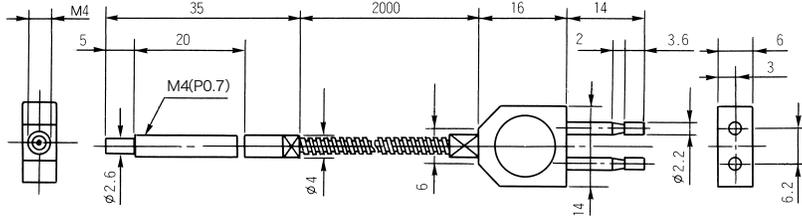
PLCs

SA9F-DM75



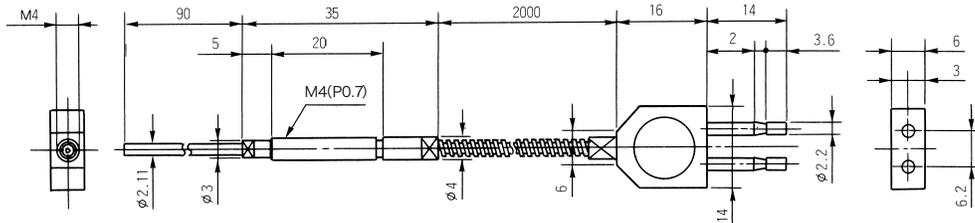
Automation Software

SA9F-DH21



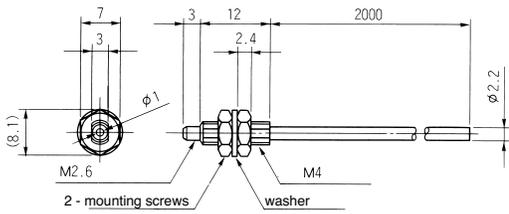
Power Supplies

SA9F-DH22



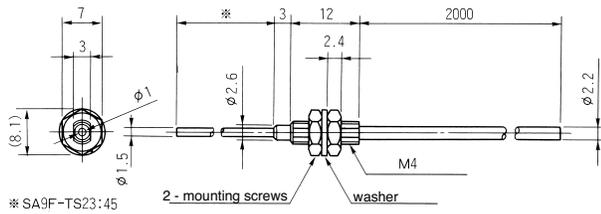
Sensors

SA9F-TS21



Communication

SA9F-TS23



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