ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *IDEC MX1A-MK948* at our website: *Click HERE*

Section Q



Selection Guide Q-2

Full Color Recognition
- SA1J, SA1J-F. Q-5
- SA1K, SA1K-F Q-11

Analog Laser Color Mark
- SA1M. Q-15

Laser Displacement
- MX1A, MX1B. Q-20

Self-Contained Laser
- MX1C Q-26

Ultrasonic Analog
- SA6A Q-29

Analog Distance
- SA1D Q-32

NEW for 2004!

Photoelectric
- SA1E Q-34

Fiber Optic Photoelectric
- SA1C-FK Q-39
- SA1C-F Q-45

Miniature Self-Contained Photoelectric
- SA1C Q-52

Slim Style Photoelectric
- SA1A, SA1B Q-56

Heavy Duty Photoelectric
- ISF Q-59

Magnetic Proximity
- DPRI Q-62

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Selection Guide

Sensor Type	Series	Page	Appearance	Advantages	Considerations
Full Color Recognition Sensors	**SA1J** **SA1J-F**	Q-5		• Use to detect registration marks (regardless of similarity of color) at high-speed (0.3ms). • Use to distinguish between different shades of the same color. • 3 LEDs (red, green, and blue) provide a long life — no need to replace lamps. • Use in wash-down environments. • Use when long distance range, high-speed, and small sensing spots are required for color sensing applications.	• Use the 3-color sensor for multiple outputs for sorting applications. • Use the small spot version to detect small objects. • Replace conventional contrasting sensors with the SA1J for reliable color sensing. • Use the auto-select mode to sort objects, to differentiate fine shades of the same color, or to detect objects moving to and from the sensor.
	SA1K **SA1K-F**	Q-11		• Use in complex color detection applications, for precise, flexible results. • Use to detect a combination of colors within one spot. • Use to differentiate fine shades of the same hue. • Output can be selected to detect a match or variance from the reference (target) color. • 9 levels of distinction can be selected to detect even highly-subtle variations or allow tolerance of minor differences in color.	• One output is provided when using the 1-color SA1K. Use the 3-color sensor for multiple outputs. • To detect multiple reference samples, it is necessary to use a corresponding number of sensors. • Halogen ambient lighting results in the most reliable, daylight-like color detection.
Analog Laser Color Mark Sensors	**SA1M**	Q-15		• Uses visible red laser for color detection. • Compensates for fluctuations of objects. • Long range: 2.75" to 5.9". • Available in small spot or parallel beam. • Dual analog and digital output.	**IMPORTANT:** Always consider safety when using laser sensors. Make sure laser beam cannot inadvertently shine into the eyes of people passing by or working in the vicinity. See safety information on page Q-25.
Laser Displacement Sensors	**MX1A** **MX1B**	Q-20		• Use in the most precise sensor applications, because of the minute size of the laser beam. • Use the MX1A/B to add or subtract measured values, calculating differences in thickness or levels. • Use the MX1C to achieve precise positioning or alignment, because the visible beam is easy to aim. • All laser sensors provide analog and digital output.	**IMPORTANT:** Always consider safety when using laser sensors. Make sure laser beam cannot inadvertently shine into the eyes of people passing by or working in the vicinity. See safety information on page Q-25. • Two MX1A/B sensors must be used together to achieve calculation of measured values.
Self-Contained Laser Sensors	**MX1C**	Q-26			
Ultrasonic Analog Sensors	**SA6A**	Q-29		• Ultrasonic sensing (using sound waves) is perfect for sensing applications which cannot be accomplished through the use of light, such as when detecting transparent items, films, and liquid levels. • Ultrasonic sensing is normally disrupted by wave interference, but the SA6A features adjustments for optimal performance, despite the effects of surface turbulence (liquid level sensing), heat waves (blowing hot air), or inductive noise interference.	• Adjustments for tolerating wave interference are not selected simultaneously. One mode is selected when encountering surface turbulence (liquid level sensing) and another mode is used when sensing under the influence of blowing hot air.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Sensor Type	Series	Page	Appearance	Advantages	Considerations
Analog Distance Sensors	**SA1D**	Q-32		• The most reliable distance sensing, calculated using the optical triangle between two points and the sensor. • Analog output and digital output provided.	• Maximum analog output value corresponds to minimum sensing distance and minimum analog value corresponds to maximum distance.
Photoelectric	**SA1E**	Q-34		• Through-beam. Long sensing range of 10m max. • Diffuse-reflective can detect light-reflecting transparent objects as well as white matt paper at a distance of 700mm. • Polarized retroreflective mirror-like objects can also be detected easily. • Small-beam reflective. Ideal for detecting small objects with easy recognition of a red LED beam.	• Long sensing ranges. • High-speed response of 1msec max. • Interference prevention allows close mounting of two switches (except for the through-beam type).
Fiber Optic Photoelectric Sensors	**SA1C-FK**	Q-39		• Optimum performance under adverse conditions including high temperatures, inductive noise, and corrosive exposure. • Maintain integrity of sensing signal over long distances. • Perfect for areas with minimal clearance. Fiber optic leads capable of great flexibility for tight installations.	• It is necessary to consider reduced maintenance expenses when evaluating cost effectiveness. • Fiber optics do not withstand impact well (may shatter).
	SA1C-F	Q-45			
Miniature Self-Contained Photoelectric Sensors (continued on the next page)	**SA1C**	Q-52		**Through-Beam Photoelectric Sensors** • Most reliable of the photoelectric sensors for detecting opaque objects. • Longer sensing range than reflected-light sensors. • Adverse effects of dirt, dust, mist, condensation, droplets, oil, or film accumulation are minimal. • High-precision results when used for positioning or leading-edge applications. • Use for detection of labels on transparent containers. • Highest excess gain (least chance for erroneous results due to inadvertent triggering).	• Not suitable for sensing clear materials. • Use to detect small objects by installing an optional slit for modifying beam size (order separately). • When mounted in close proximity with other sensors or when extraneous light interferes with detection, order the optional slit separately. • Using the optional slit to modify beam size decreases sensing range. • Vibration tends to produce unreliable results. • Two additional wires to install. • Sensing range: 32' - 9 3/4"

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Sensor Type	Series	Page	Appearance	Advantages	Considerations
Miniature Self-Contained Photoelectric Sensors (continued)	**SA1C**	Q-52		**Diffuse-Reflected Light Photoelectric Sensors**	
				• Projector and receiver contained in one housing (no separate receiver or reflective backplate to install). • Can be used for elementary color differentiation, when colors reflect different levels of light intensity. (Green LED light source is preferred for this application.)	• Results are impaired when background area is more reflective than object being detected. • When sensing shiny materials, sensing beam must be perpendicular to object surface (no angle). • Beam is too large for precise applications. • Sensing distance: 23.62"
				Limited- and Spot-Reflected Light Photoelectric Sensors	
				• Projector and receiver contained in one housing (no separate receiver or reflective backplate to install). • Preferred over diffuse-reflected light sensors when extraneous light may interfere with sensing results.	• Sensing ranges over 3.94" (100mm) are not possible
				Retro-Reflected Light Photoelectric Sensors	
				• Projector and receiver contained in one housing (necessary to install separate reflective backplate). • Preferred over diffuse-reflected light photoelectric sensors when extraneous light may interfere with sensing. • Best results when used for sensing large objects.	• Not suitable for detecting small parts. • Not suitable for precise positioning. • Use polarization for shiny objects. • Sensing range: 16' - 4 7/8"
				Polarized Retro-Reflected Light Photoelectric Sensors	
				• Projector and receiver contained in one housing (necessary to install separate reflective backplate). • Preferred over diffuse-reflected light photoelectric sensors when extraneous light may interfere with sensing. • Best results when used for sensing large objects. • Best suited for mirror-like objects. • Used to avoid false signals triggered by shiny surfaces.	• Not suitable for detecting small parts. • Not suitable for precise positioning. • Use polarization for shiny objects. • Polarization decreases scanning distance. • Sensing range: 9' - 10 1/8"
Slim Style Photoelectric Sensors	**SA1A** **SA1B**	Q-56		• Available in broad and narrow styles which are ideal for limited space. • Transistor output with Light ON or Dark ON.	• Two sensory modes: Through-beam (6.5') Diffused beam (2")
Heavy Duty Photoelectric Sensors	**ISF**	Q-59		• Universal voltage type (24 to 240V AC/DC). • Built-in 0.1 to 5 second time delay. • Selectable Light ON or Dark ON. • Touch-down terminals.	• Available in various modes: Through-beam Diffuse-reflected Retro-reflected Polarized retro-reflected
Magnetic Proximity Switches	**DPRI**	Q-62		• Lightweight, compact design reduces mounting space requirements. • Sealed reed contact. • Long life and high reliability.	• Operating distance range: 0 to 4mm

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1J: Full Color Recognition Sensors

Introducing a cost-effective solution for full color sensing applications—IDEC's SA1J full color recognition sensor. Outstanding benefits of the SA1J include an extremely high response speed (0.3ms), high resolution, and a very low cost.

Key features of the SA1J color sensor include:

- Choice of a 3-color version or a 1-color version
- Fast response (0.3ms)—perfect for sensing complex color marks at high speed
- Three LEDs (Red, Green, and Blue) provide a long sensing life
- Easy alignment and targeting using a visible spot
- Set sensor with the touch of a button
- Highly sensitive to variations in color; can distinguish between subtle shades of the same color
- Up to 60mm sensing distance
- IP67 rated



CE

General Specifications	1-Color Version	3-Color Version
Power Voltage	12 to 24V DC (ripple 10% maximum) Operating voltage: 10 to 30V DC	
Current Draw	150mA maximum	
Dielectric Strength	Between live and dead parts: 1,000V AC, 1 minute	
Insulation Resistance	Between live and dead parts: 20MΩ minimum (500V DC megger)	
Operating Temperature	–10 to +50˚C (performance will be adversely affected if the sensor becomes coated with ice)	
Operating Humidity	35 to 85% RH (avoid condensation)	
Storage Temperature	–30 to +70˚C	
Vibration Resistance	Damage limits: 10 to 55Hz Single amplitude: 0.75mm 2 hours in each of 3 axes	
Shock Resistance	Damage limits: 500m/s^2 (approximately 50G) 5 shocks in each of 3 axes	
Extraneous Light Immunity	Sunlight: 10,000 lux maximum Halogen lamp: 3,000 lux maximum	
Material	Housing: Aluminum Lens: Glass Cover: Polyarylate	
Degree of Protection	IP67—IEC Pub 529	
Cable	Cable type: ø5.4mm 5-core oiltight vinyl cabtyre cable (0.2mm^2) 2m long	Cable type: ø5.4mm 7-core oiltight vinyl cabtyre cable (0.2mm^2) 2m long
Weight	Approximately 250g	
Dimensions (HxWxD)	1.97" x 1.18" x 3.15" (50 x 30 x 80mm)	
Accessories	Adjusting screwdriver	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA1J Sensors

1-Color Version	3-Color Version	Output	Spot Diameter	Sensing Distance	Inspection Spot
SA1J-C1N1	SA1J-C1N3	NPN	ø 0.157" (ø 4mm) ø 0.236" (ø 6mm) ø 0.315" (ø 8mm)	1.575" (40mm) 1.969" (50mm) 2.362" (60mm)	Standard
SA1J-C1P1	SA1J-C1P3	PNP			
SA1J-C2N1	SA1J-C2N3	NPN	ø 0.098" (ø 2.5mm) ø 0.118" (ø 3mm) ø 0.177" (ø 4.5mm)	0.591" (15mm) 0.787" (20mm) 0.984" (25mm)	Small
SA1J-C2P1	SA1J-C2P3	PNP			

		1-Color Version	3-Color Version
Function Specifications	**Reference Color Registration**	Push SET button (sensor aimed at color target); sensor records reference color in EEPROM memory	**Set dial to A:** Push SET button (sensor aimed at color target A); sensor records reference color A in EEPROM memory **Set dial to B:** Push SET button (sensor aimed at color target B); sensor records reference color B in EEPROM memory **Set dial to C:** Push SET button (sensor aimed at color target C); sensor records reference color C in EEPROM memory
	Tolerance	Digital setting for 5 degrees of inspection sensitivity	Digital setting for 5 degrees of inspection sensitivity (normal run mode only)
	Inspection Mode	Selectable: Color component only (C) or color component plus intensity (C+I) (depth of color)	
	Operation Mode	—	**Selectable**: **S run:** Auto select, sensor determines tolerance (no need to set tolerance) **Normal run mode:** Manually select tolerance (1–5) for each reference color
	Synchronous Mode	Selectable: Internal response mode or synchronized with an external signal	
	Response Mode	High-speed (F): 0.3ms Normal speed (N): 1ms Slow speed (S): 5ms	High-speed (F): 0.8ms Normal speed (N): 1.5ms Slow speed (S): 6ms
	Control Output	On: Detected color matches target color NPN or PNP transistor open collector 30V DC, 100mA maximum Residual: 1.5V maximum, short circuit protection	**Control output A on:** Detected color corresponds to target color A* **Control output B on:** Detected color corresponds to target color B* **Control output C on:** Detected color corresponds to target color C* NPN or PNP transistor open collector 30V DC, 100mA maximum Residual: 1.5V maximum, short circuit protection
	Operation LED	On: When control output is on (yellow LED)	
	Off-Delay Timer	Selectable: Timer ON (T-ON) or Timer OFF (T-OFF)	
	Timer	OFF delay timer 40ms	
	SET Input	**NPN**: 30V DC maximum/3.6mA (when connected to 0V) Typical operating voltage: (0V) +4V maximum **PNP**: 30V DC maximum/3mA (when connected to 24V) Typical operating voltage: (+V) –4V maximum	**NPN**: 30V DC maximum/3.6mA (when connected to 0V) Typical operating voltage: (0V) +4V maximum **PNP**: 30V DC maximum/3mA (when connected to 24V) Typical operating voltage: (+V) –4V maximum
	External Synchronous Input		
	Light Source	3 LEDs (Red, Green, Blue)	

1. Each channel has its own independent short circuit protection.
*2. * The target color is defined by the operation mode setting.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1J-F: Full Color Fiber Optic Sensors

This new line of full color sensors offers IDEC's proven color sensing technology in a fiber optic version. The SA1J-F is ideal for color sorting and quality control applications where space is limited. The SA1J-F utilizes a wide assortment of fiber optic heads to fit in the smallest of mounting areas. This product line offers both 1 and 3-color programmable sensors for multiple color sorting applications. With the touch of a button, the SA1J-F is programmed and ready to work. The SA1J-F also has a remote lead for programming by a remote PLC or switch.



Key features of the SA1J-F color sensor include:

- Choice of a 3-color version or a 1-color version
- Wide assortment of fiber optic heads fit in tight mounting areas
- Three LEDs (Red, Green, and Blue) provide a long sensing life
- High speed response time (0.3 msec)
- Simple one touch button and remote color teach functions
- IP67 rating for use in harsh wet environments

General Specifications

	1-Color Version	3-Color Version
Power Voltage	12 to 24V DC (ripple 10% maximum) Operating voltage: 10 to 30V DC	
Current Draw	150mA maximum	
Dielectric Strength	Between live and dead parts: 1,000V AC, 1 minute	
Insulation Resistance	Between live and dead parts: 20MΩ minimum (500V DC megger)	
Operating Temperature	–10 to +50˚C (no freezing)	
Operating Humidity	35 to 85% RH (avoid condensation)	
Storage Temperature	–30 to +70˚C	
Vibration Resistance	Damage limits: 10 to 55Hz Single amplitude: 0.75mm 2 hours in each of 3 axes	
Shock Resistance	Damage limits: 500m/s^2 (approximately 50G) 5 shocks in each of 3 axes	
Extraneous Light Immunity	Sunlight: 10,000 lux maximum Incandescent lamp: 3,000 lux maximum	
Material	Housing: Aluminum Lens: Glass Cover: Polyarylate	
Degree of Protection	IP65 (when inserting the fiber unit and tightening the cover)	
Cable	0.2mm^2 ø5.4mm 5-core vinyl cabtyre cable, 2m long	0.2mm^2 ø5.4mm 7-core vinyl cabtyre cable, 2m long
Weight	Approximately 190g	
Dimensions (HxWxD)	47H x 25W x 82.4D mm	
Accessories	Mounting bracket Adjusting screwdriver	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Subassembled Part Numbers: SA1J-F Sensors

Amplifiers

Part No.	Type	Output Type
SA1J-F1N1	1-color	NPN open collector 30V DC, 100mA
SA1J-F1N3	3-color	
SA1J-F1P1	1-color	PNP open collector 30V DC, 100mA
SA1J-F1P3	3-color	

Diffuse-Reflected Light Fiber Optic Unit

Part No.	Inspection Spot	Sensing Range
SA9F-DA11	ø 2.5 mm	10 mm
SA9F-DA12	ø 5 mm	20 mm
SA9F-DA13	ø 8 mm	30 mm

Lens Attachments

Part No.	Description	Used With	Sensing Range
SA9Z-F11	For long range detection of opaque objects	SA9F-TS21	300 mm
		SA9F-TC21	200 mm
		SA9F-TM21	150 mm
SA9Z-F12	Sideview attachment	SA9F-TS21	25 mm
		SA9F-TC21	20 mm
		SA9F-TM21	20 mm

Accessories

Part No.	Description
SA9Z-F01	Fiber Cutter

		SA1J-F1N1	SA1J-F1N3	SA1J-F1P1	SA1J-F1P3
Function Specifications	Reference Color Set	Teaching system, 1-color	Teaching system, 3-colors	Teaching system, 1-color	Teaching system, 3-colors
	Inspection Tolerance	5-step digital setting			
	Inspection Mode	Color (C) / Color + Intensity (C+1)			
	Operation Mode	Normal Run Mode (1 to 5)	Normal Run Mode (1 to 5) / Select Run Mode	Normal Run Mode (1 to 5)	Normal Run Mode (1 to 5) / Select Run Mode
	Synchronous Mode	Internal Synchronous Mode (INT) / External Synchronous Mode (EXT)			
	Response Mode	Fast (F) / Normal (N) / Slow (S)			
	OFF-delay Timer	Timer On (T-ON) / Timer Off (T-OFF)			
	Control Output	NPN open collector 30V DC, 100mA maximum Voltage Drop 1.5V maximum Protected against short circuit		PNP open collector 30V DC, 100mA maximum Voltage Drop 1.5V maximum Protected against short circuit	
	SET input External Synchronous Input	30V DC maximum / 3.6mA (when connected to 0V) Typical Operating Voltage: (0V) + 4V maximum		30V DC maximum / 3.0mA (when connected to 24V) Typical Operating Voltage: (+V) - 4V maximum	
	Operation Indicator	Yellow LED	Yellow LED (3-color individual display)	Yellow LED	Yellow LED (3-color individual display)
	Timer	OFF-delay timer 40 msec			
	Output Operation	Equivalent Output			
	Response Time	FAST (0.3 msec), NORMAL (1 msec), SLOW (5 msec) selectable	FAST (0.8 msec) NORMAL (1.5 msec) SLOW (6 msec) selectable	FAST (0.3 msec), NORMAL (1 msec), SLOW (5 msec) selectable	FAST (0.8 msec) NORMAL (1.5 msec) SLOW (6 msec) selectable
	Light Source	Three LEDs (red, green, blue)			

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Fiber Optic Units

			SA9F-DA11	SA9F-DA12	SA9F-DA13
Specifications	Type		Spot-detection	Standard	Long-Range
	Sensing		Diffuse reflex		
	Amplifier Unit		SA1J-F1N1, -F1N3, -F1P1, -F1P3		
	Sensing Range		10 mm	20 mm	30 mm
	Sport Diameter		ø 2.5 mm	ø 5 mm	ø 8 mm
	Material	Sensing Head	Body: PA66, Front Core: PC		
		Fiber Optic	Surface: PE, Core: PMMA		
	Fiber Optic Length		2 m		
	Degree of Protection		IP65		
	Operating Temperature		-10° C to +55° C (no freezing)		
	Operating Humidity		35 to 85% RH (no condensation)		
	Allowable Bending Radius		R40mm minimum		

The following fiber optic units for the SA1C-F photoelectric switches can also be used with the SA1J-F:

Through Beam Fiber Optic Units

Part No.	Type	Sensing Range
SA9F-TS21	M4 • Straight No Sleeve	30 mm
SA9F-TS22	M4 • Straight 90 mm Sleeve	30 mm
SA9F-TS23	M4 • Straight 45 mm Sleeve	30 mm
SA9F-TC21	M6 • Coiled No Sleeve	25 mm
SA9F-TC22	M6 • Coiled 90 mm Sleeve	25 mm
SA9F-TC23	M6 • Coiled 45 mm Sleeve	25 mm
SA9F-TM21	M4 • Multicore	25 mm
SA9F-TM22	M4 • Multicore 90 mm Sleeve	25 mm
SA9F-TM23	M4 • Multicore 45 mm Sleeve	25 mm
SA9FTM74	Multicore 16 fibers in 1 row	25 mm

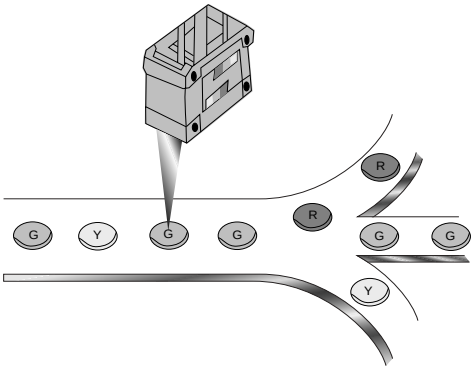
Diffuse-Reflected Light Fiber Optic Unit

Part No.	Type	Sensing Range
SA9F-DS31	M6 • Straight No Sleeve	6 mm
SA9F-DS32	M6 • Straight 90 mm Sleeve	6 mm
SA9F-DS33	M6 • Straight 45 mm Sleeve	6 mm
SA9F-DD31	M6 • Coaxial	5 mm
SA9F-DM74	1 row = 32 fibers Multicore	2 mm
SA9F-DM75	2 rows = 16 each Multicore	5 mm

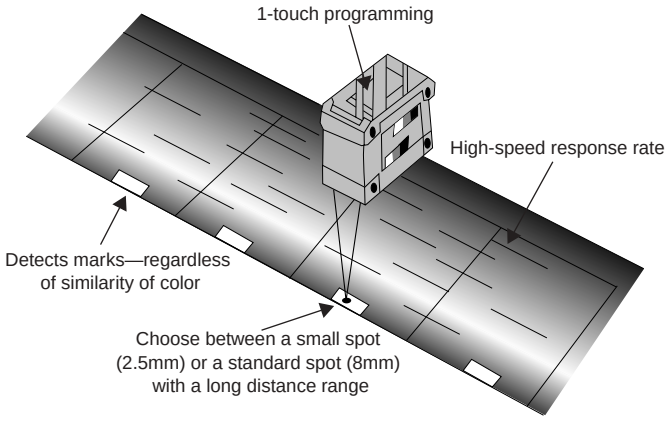
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Applications

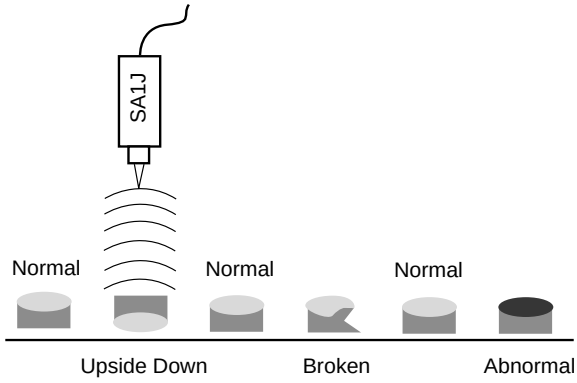
Sorting objects by cap or lid color



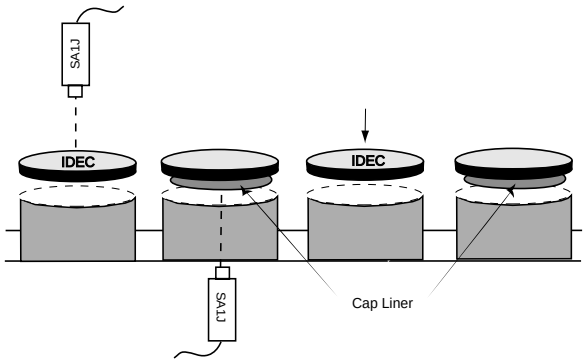
Detecting plastic bagging materials on a web



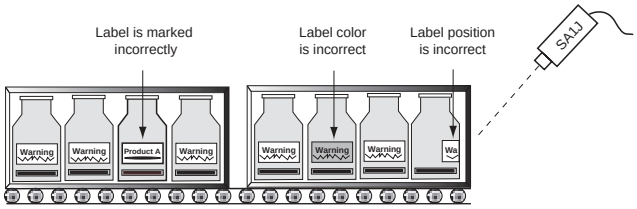
Detecting objects that are the incorrect shape or color



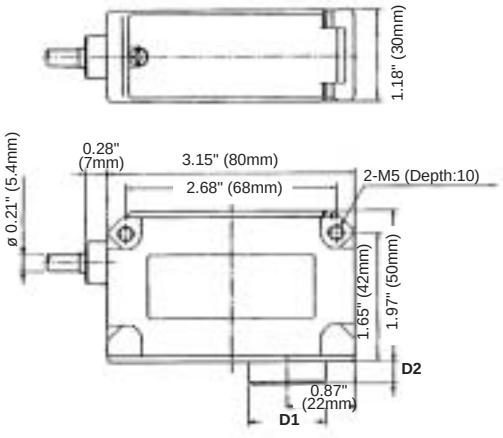
Detecting presence or absence of a logo on a cap or lid

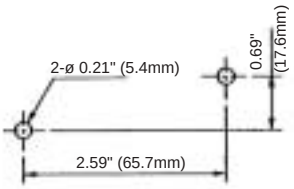


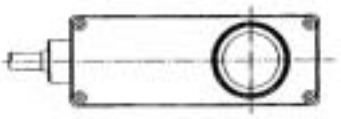
Checking packaging labels for correct position, color, and content



Dimensions







D1 = SA1J-C1❑❑ model = ø 0.99" (25.2mm)
[SA1J-C2❑❑ model = ø 1.06" (27mm)]

D2 = SA1J-C1❑❑ model = ø 0.26" (7mm)
[SA1J-C2❑❑ model = ø 0.50" (12.8mm)]

Q

Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SAIK: Full Color Recognition Sensors

Recognize a specific combination of different colors.

Differentiate between very subtle shades of the same color.

Tolerate a range of hues similar to a reference color.

Memorize three different colors with the three-color SA1K sensor!

Specify separate, interchangeable fiber optic cords: one sensor head, three sensor heads, and heat-resistant.

Programming is simple: aim the sensor at the target color and push the color preset button. The sensor records the reference color in its memory.

Key features of the SA1K include:

- NPN or PNP outputs
- Multiple outputs (three-color sensor) can be used individually or combined to signal five variations of the same color hue
- High-speed: 2ms response for one-color sensors and 3ms response for three-color sensors
- Normal speed (average 10 inspections 1 output): 12ms response (1-color) and 13ms response (3-color) — best for detecting uneven color coverage
- DIN rail (35mm) mount (amplifier for fiber optics) or surface mount
- IP65 protection rating



CE

General Specifications

Power Voltage	12V DC ±5% (ripple 10% maximum)
Current Draw	800mA (maximum)
Dielectric Strength	Between input and output: 1000V AC 50/60Hz, 1 minute
Insulation Resistance	Between input and output: 20MΩ (minimum), with 500V DC megger
Operating Humidity	35 to 85% RH (avoid condensation)
Operating Temperature	Lens style and amplifier (only) of fiber optic units: –10° to +40°C Fiber optic cord (only): –30° to +80°C Heat-resistant fiber optic cord: –30° to +350°C — rating applies to the 66.93" (1.7m) length of cord closest to the sensor head. The full cord is 78.74" (2m) long. (performance will be adversely affected if the sensor becomes coated with ice)
Storage Temperature	Lens style and amplifier (only) of fiber optic units: –30° to +70°C Fiber optic cord (only) (standard and heat-resistant): –30° to +80°C
Vibration Resistance	Damage limits: 10 to 55Hz, amplitude 1.5mm p-p, 2 hours in each of 3 axes
Shock Resistance	Damage limits: 300m/sec^2 (approximately 30G), 3 shocks in each of 3 axes
Extraneous Light Immunity	Lens style, integrated amplifier/fiber optic cord: 500 lux (maximum) from halogen lamp Separate, interchangeable amplifier and cords: 1000 lux (maximum) from halogen lamp — defined as incident or unwanted light received by a sensor, unrelated to the presence or absence of the intended object
Material	Amplifier housing: aluminum with polyarylate rear cover Lens: glass Standard fiber optic: glass fiber with PVC spiral tube and nickel-plated brass sensor head Heat-resistant fiber optic: glass fiber with SUS spiral tube and SUS 303 sensor head
Degree of Protection	IP65 — IEC Pub 529, sensors rated IP65 are dust-tight, water-resistant, and perform best when not subjected to heavy particle or water blasts
Cable	Cable type: 7-core (one-color sensor) or 9-core (three-color sensor) oiltight vinyl cabtyre, 9' 10 1/8" (3m) long
Weight	Lens style, interchangeable amplifier: 550g Integrated amplifier/fiber cord: 750g
Dimensions	Housing, lens style: 2.95"H x 1.33"W x 3.43"D (75mm x 34mm x 87.3mm) Housing, fiber optic: 3.35"H x 1.65"W x 5.12"D (85mm x 42mm x 130mm) Fiber optic cord (only): 3' 3 1/3" (1m); Heat-resistant cord (only): 6' 6 3/4" (2m) long

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: Self-Contained (Lens) Style

One-Color	Three-Color	Input	Output	Inspection Spot	Stand-Off	Ordering
SA1K-C1N3 **SA1K-C1P3**	**SA1K-C1N7** **SA1K-C1P7**	NPN PNP	NPN PNP	Ø 0.394" (Ø 10mm)	1.38" (35mm)	Lens style: Amplifier and lens are integrated in the same housing; one part number = complete sensor (no mounting bracket included)
SA9Z-L01						Replacement bulb for SA1K

Part Numbers: Separate, Interchangeable Amplifier and Fiber Optic Cords

One-Color	Three-Color	Input	Output	Inspection Spot	Stand-Off	Ordering
SA1K-FAN3 **SA1K-FAP3**	**SA1K-FAN7** **SA1K-FAP7**	NPN PNP	NPN PNP	Depends on fiber optic cord used (see below)		Amplifier only (order separately) — used with separate fiber optic cords only (shown below)
SA1K-TF1 **SA1K-TF2**		Standard fiber optic cord Heat-resistant (–30 to +350°C)		Ø 0.196" (5mm) Ø 0.276" (7mm) Ø 0.394" (10mm)	0.157" (4mm) 0.276" (7mm) 0.394" (10mm)	Separate, interchangeable fiber optic cords (order separately) — used with 1-color or 3-color amplifier only (above) (SA1K-TF1 and-TF2 come with **SA9Z-KF1** and **-KF3** brackets; SA1K-TF3 comes with (3) **SA9Z-KF1** and (3) **SA9Z-KF4** brackets)
SA1K-TF3		Fiber optic cord with three sensor heads (standard high-resolution)		Ø 0.118" (3mm) Ø 0.196" (5mm) Ø 0.276" (7mm)	0.118" (3mm) 0.236" (6mm) 0.354" (9mm)	

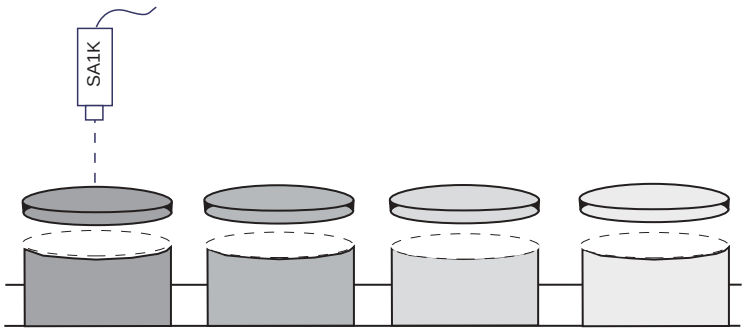
1. Integrated amplifier/fiber optic units are calibrated in pairs — use the same serial numbers together. A separate fiber optic cord cannot be used with an amplifier from an integrated amplifier/fiber optic set. A separate fiber optic cord can be used with an "amplifier only" unit (SA1K-FA ■■).
2. Order SA9Z-L01 separately for one replacement halogen lamp (one spare bulb is included with each unit). All fiber optic units come with a mounting bracket and nut (SA9Z-KF1). Each fiber optic unit also includes the corresponding mounting bracket as noted.

Function Specifications

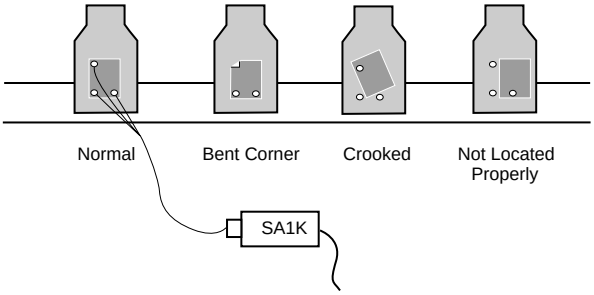
	One-Color Sensors	Three-Color Sensors
Reference Color Registration	Push color preset button (sensor aimed at color target), sensor records reference color in EEPROM memory	**Set dial to A:** push preset button (sensor aimed at color target A); sensor records reference color A in EEPROM memory **Set dial to B:** push preset button (sensor aimed at color target B); sensor records reference color B in EEPROM memory **Set dial to C**: push preset button (sensor aimed at color target C); sensor records reference color C in EEPROM memory
Tolerance	Digital setting for nine degrees of inspection sensitivity	
Inspection Mode	Selectable: color component only or color component plus intensity (depth of color)	
Synchronous Mode	Selectable: internal response mode or synchronize with an external signal	
Operation Mode	Selectable: **Equivalent (=):** output on when detected color matches target color **Different (≠):** output on when detected color differs from target color	Selectable: **S:** auto select, sensor determines tolerance (no need to set tolerance) **N:** normal mode, match one of three reference colors — set tolerance LMT: confirm or change tolerance setting for each target color
Response Mode	High-speed (F): 2ms (each inspection = 1 output) Normal speed (S): 12ms (10 inspections averaged = 1 output)	High-speed (F): 3ms (each inspection = 1 output) Normal speed (S): 13ms (10 inspections averaged = 1 output)
Control Output	On: detected color matches target color or differs from target color defined by the operation mode setting NPN or PNP transistor open collector 28V DC, 100mA (maximum); Residual: 2V (maximum); Short circuit protection	Control output A on: detected color corresponds* to target color A Control output B on: detected color corresponds* to target color B Control output C on: detected color corresponds* to target color C (*defined by operation mode setting) NPN or PNP transistor open collector 28V DC, 100mA (maximum); Residual: 2V (maximum); Short circuit protection
Alarm Output	On: when halogen lamp is burned out NPN or PNP transistor open collector 28V DC, 100mA (maximum); Residual voltage 2V (maximum); Short circuit protection	
Set Input	12V DC, 10mA, 12V supply (input is not isolated due to common ground connection — photocoupler used)	
Synchronous Input	12V DC, 10mA, 12V supply (input is not isolated due to common ground connection — photocoupler used)	
Operation LED	On: when control output is on (red LED)	
Light Source	Halogen lamp 12V, 5W, life: 2,000 hours; Order SA9Z-L01 separately for one replacement halogen lamp (one spare bulb is included with each unit)	
Receiver Element	RGB color recognition element	
Minimum Bending Radius	Integrated amplifier/fiber optic units: 1.38" (35mm); Separate fiber optic cords: 1" (25mm)	
Detectable Color Difference	Lens style and separate fiber optic cords: $\Delta E \geq 10$; Integrated amplifier/fiber optic units: $\Delta E \geq 15$ — while online, defined by CIE as measurement of color difference (3-variable function: values for light, hue, and chroma, plotted on XYZ axis)	

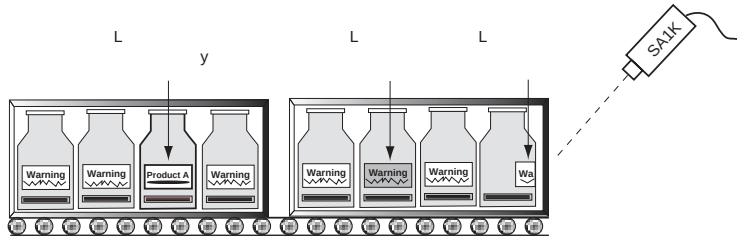
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Applications

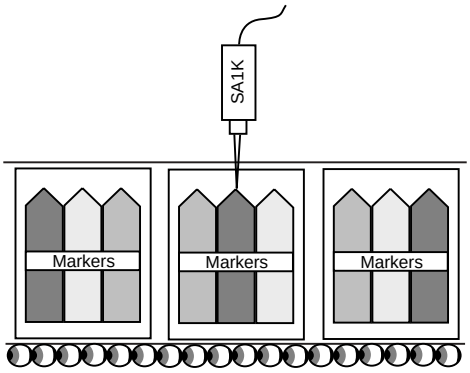


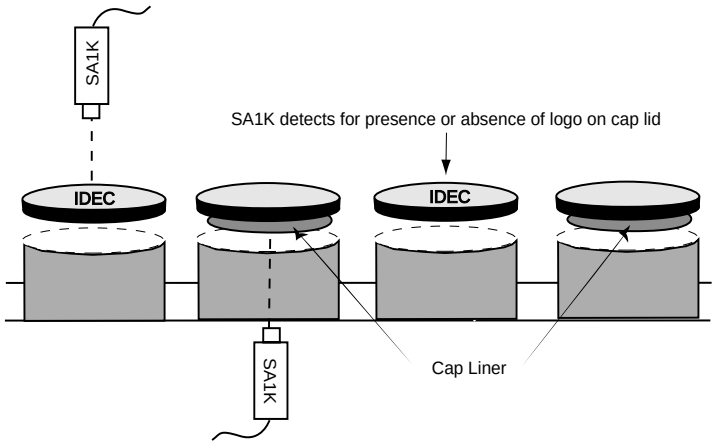
Differentiate subtle variations in shades of color for quality control

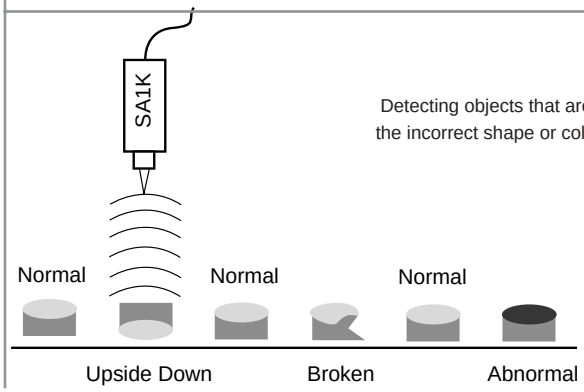




Detects packaging labels for correctness of position, color, and content.
The SA1K can either detect a precise color or a combination of colors.







Beam must be aimed within 12˚ to target surface.

Q Sensors

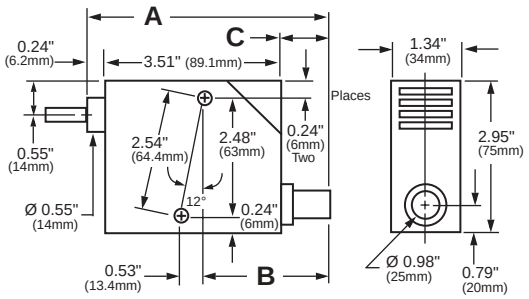
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions

SA1K and SA1K-F (All Styles)

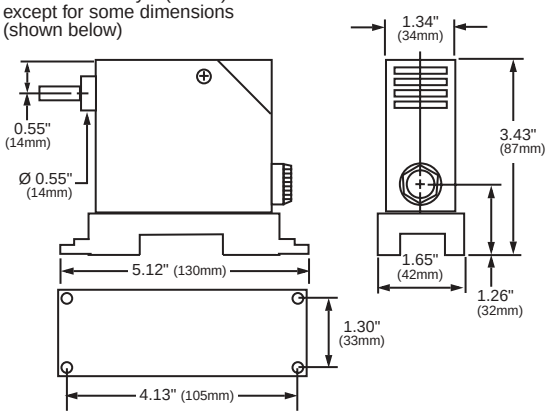
Dimensions	A	B	C
SA1K-C2N3, 7 SA1K-C2P3, 7	4.81" (122.3mm)	2.30" (58.5mm)	1.06" (27mm)
All Other Units (Lens and Fiber)	5.01" (127.3mm)	2.50" (63.5mm)	1.26" (32mm)

Self-Contained (Lens) Style

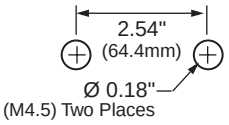


Fiber Optic Amplifiers

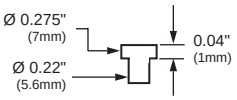
Same as lens style (above) except for some dimensions (shown below)



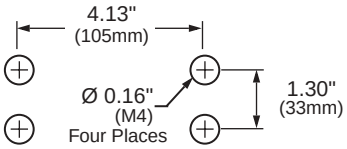
Panel Cut-Out: Lens Style



Typical Countersink: Two Holes



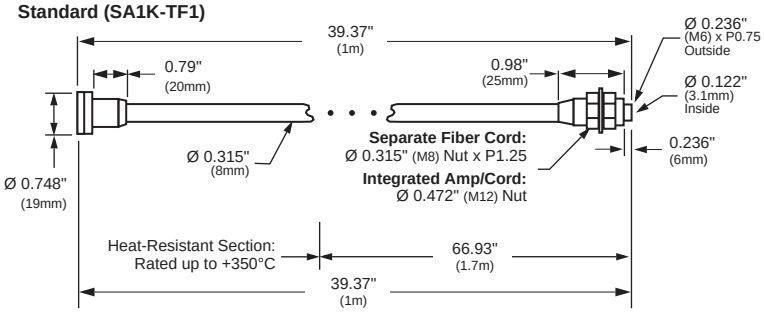
Panel Cut-Out: Fiber Optic



Fiber Optic Cords

Minimum bending radius =
1.38" (35mm) for integrated amplifier/fiber optic units
1" (25mm) for separate fiber optic cords

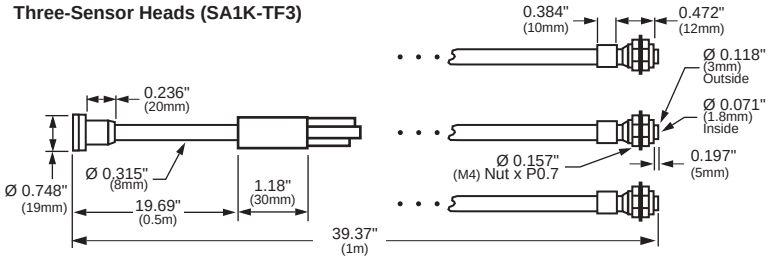
Standard (SA1K-TF1)



Heat-Resistant (SA1K-TF2)

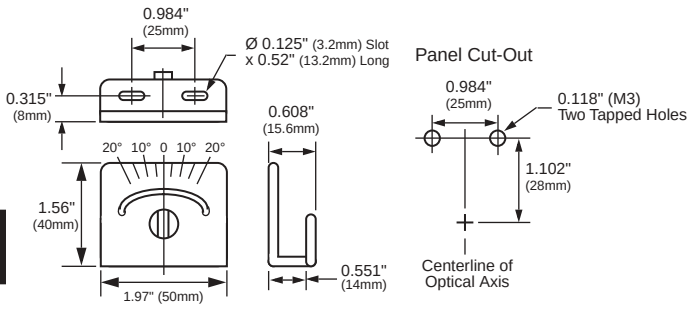
Same as standard (SA1K-TF1) except length = 78.74" (2m).

Three-Sensor Heads (SA1K-TF3)

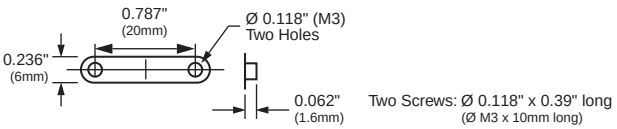


Accessories

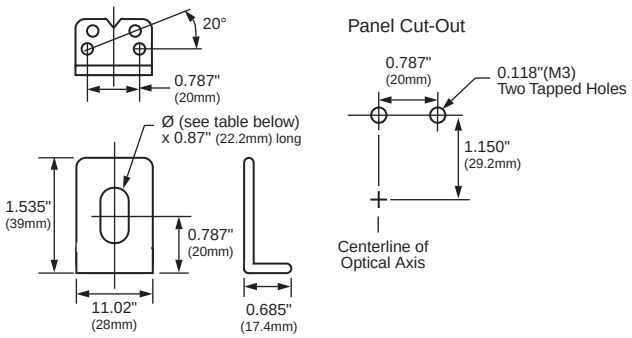
SA9Z-KF1: Fiber Optic Mounting Bracket
Comes with all fiber optic units (integrated amplifier/fiber optic and separate fiber optics). Can be ordered separately. Comes with nut (below).



Mounting Nut (comes with SA9Z-KF1)



SA9Z-KF2, -KF3, and -KF4: Fiber Optic Mounting Bracket
Comes with corresponding fiber optic unit (see table below). Also can be ordered separately.



Accessories

Part #	Comes With	Slot Ø
SA9Z-KF2	Integrated Amplifier/Fiber Optic Units	Ø 0.48" (12.2mm)
SA9Z-KF3	Separate Fiber Optics SA1K-TF1, -TF2	Ø 0.32" (8.2mm)
SA9Z-KF4	Separate Fiber Optics SA1K-TF3	Ø 0.17" (4.2mm)

Q

Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1M: Analog Laser Color Mark Sensors

Using a visible red laser (670nm), the SA1M Laser Mark sensor is excellent for detecting label alignment and different kinds of objects. The small spot version can easily detect tiny objects. The parallel beam version keeps the detection spot size unchanged, regardless of the distance between the sensor and the object. Both versions ensure stable sensing without being influenced by changes in the sensing range and are ideal for use in varying environmental conditions.



Key features of the SA1M include:

- Stable output over a wide sensing range: 2.755" to 5.906" (70 to 150mm)
- Small visible beam enables detection of tiny objects (such as a spot) and thin materials
- High tolerance of fluctuating surface levels—ignores movement while sensing
- Insensitive to vertical movement of material to and from the sensor, as in the case of web flutter
- Ideal for use in industrial environments
- Dual analog output (light intensity and distance) and digital output
- IP65 protection rating

General Specifications

Power Voltage	24V DC (ripple 10% maximum)
Current Draw	200mA maximum
Light Source Element	Laser diode (670nm)
Receiver Element	PSD (position sensitive device)
Dielectric Strength	Between live and dead parts: 500V AC, 1 minute
Insulation Resistance	Between live and dead parts: 20MΩ minimum (500V DC megger)
Operating Temperature	0 to +45°C (performance will be adversely affected if the sensor becomes coated with ice)
Storage Temperature	–20 to +70°C
Operating Humidity	35 to 85% RH (avoid condensation)
Vibration Resistance	Damage limits: 10 to 55Hz Single amplitude: 0.75mm 2 hours in each of 3 axes (de-energized)
Shock Resistance	Damage limits: 100 m/s^2 (approximately 10G) 5 times in each of 3 axes (when de-energized)
Extraneous Light Immunity	Incandescent light, 3,000 lux maximum
Operating Atmosphere	Free from corrosive gasses
Material	Housing: Zinc diecast Coverplate: Polyarylate Filter: Glass
Degree of Protection	IP65 IEC Pub 529
Cable	Cable type: 6-core vinyl cabtyre cable 0.19mm^2: 6' –6-3/4' (2m) long
Weight	Approximately 400g
Dimensions (HxWxD)	1.97" x 0.83" x 3.07" (50 x 21 x 78mm)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA1M Sensors

Part Number	Spot Type	Sensing Range	Digital Output	Analog Output for Light Intensity (color mark)	Analog Output for Sensing Distance
SA1M-CK4-AC	Small spot	2.755" to 5.906" (70mm to 150mm)	NPN open collector	4 to 20mA 5V maximum	20 to 4mA 5V maximum
SA1M-CK4-BC	Parallel beam				
SA1M-CL4-AC	Small spot		PNP open collector		
SA1M-CL4-BC	Parallel beam				

Function Specifications

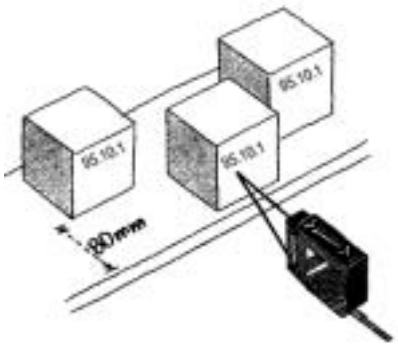
Sensing Range	2.755" to 5.906" (70 to 150mm)
Digital Output	Output style: NPN open collector: (SA1M-CK4-AC/BC) PNP open collector: (SA1M-CL4-AC/BC) with short circuit protection Output type: Window comparator output (in-window ON) Response time: 1ms maximum Hysteresis: 5% (0.8mA) maximum (over the entire sensing range) Applied voltage: 30V DC maximum Load current: 100mA maximum Voltage drop: 1.0V maximum (SA1M-CK4-AC/BC) 1.5V maximum (SA1M-CL4-AC/BC)
Analog Output for Light Intensity (color mark detection)	Analog current output: 4 to 20mA, 5V maximum Reference output current **(Note 1)**: 19.0+/-0.4mA Output stability **(Note 2)**: ±5% (±0.8mA) maximum (against reference output current over the entire sensing range) Temperature drift (**Note 3**): ±5% (±0.8mA) maximum (against reference output current over the entire operating temperature) Response time: 1ms maximum (10 to 90% response) Additional noise **(Note 2)**: 0.4mA maximum p-p (Position: 70mm)
Auxiliary Output (Note 4) (analog output for distance)	Analog current output: 20 to 4mA, 5V maximum Linearity error **(Note 2)**: ±1.5% FS (±1.2mm) (over the entire sensing range) Resolution **(Note 2)**: 0.008" (200µm); Position: 70mm Temperature drift **(Note 3)**: 5µA/˚C maximum (against the entire operating temperature) Response time 1ms maximum (10 to 90% response)
Sensitivity Selections	Selection using the sensitivity selector: L: Low (low sensitivity, 35% of standard sensitivity) M: Middle (Standard sensitivity) H: High (high sensitivity, 3.5 times standard sensitivity)
Indicators	Analog output for light intensity: Red LED (10-dot level meter, Mode selector: RUN) Digital output setting monitor: Red LED (10-dot level meter, Mode selector: SET1, SET2) Digital output: Red LED (turns on when output is on) Laser diode emission: Green LED (turns on while laser is emitted), laser emits approximately 1 second after power-up
Accessories	Adjusting screwdriver, resistor (249Ω), operating instructions, warning label, precaution label

Measuring conditions:
1. Temperature: 25˚C, Object: White ceramic (0.6mm thickness), Sensitivity: Middle, Position: 110mm
2. Temperature: 25˚C, Object: White ceramic (0.6mm thickness), Sensitivity: Middle
3. Object: White ceramic (0.6mm thickness), Sensitivity: Middle, Position: 110mm
4. Auxiliary output should be used only to monitor distance

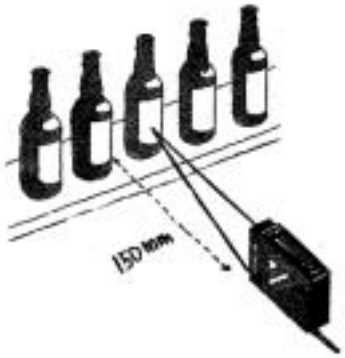
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Applications

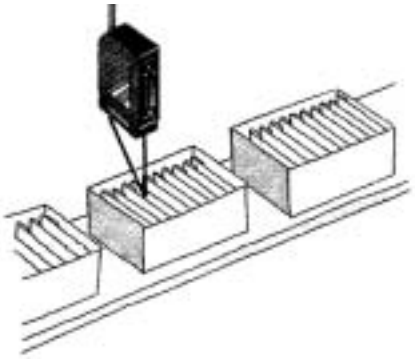
Stable output response over a wide sensing range, detecting the presence of package markings



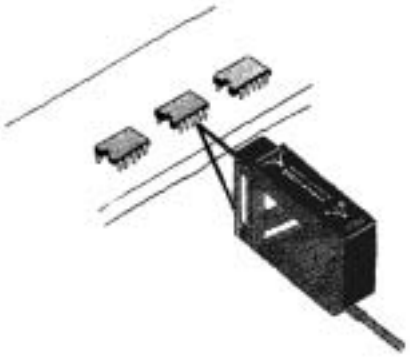
Long sensing distance (150mm maximum)



Counting the number of packages in a box



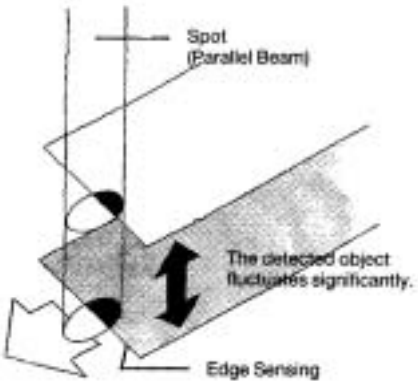
Small beam spot (0.5 x 1mm) (small spot type)



Compensating for fluctuating objects (parallel beam type) (±40mm)



Parallel beam type (beam size: 2 X 4mm)



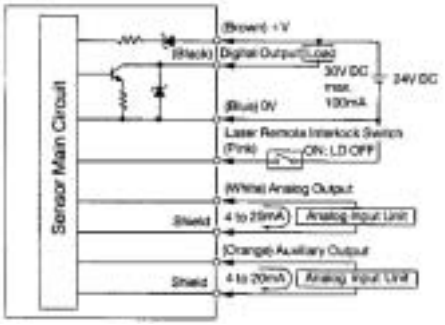
When the distance between the sensor and object varies significantly in positioning and edge sensing, the spot size remains unchanged, thus ensuring stable sensing.

When the output should not be influenced by blurs, taints, fine patterns, or lines in the object surface, stable sensing is ensured by the relatively large spot size.

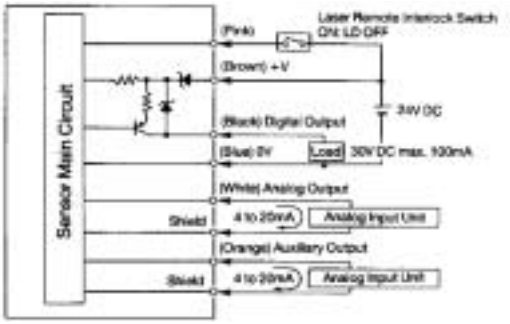
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Schematics

Connection Example (SA1M-CK4-AC/BC (NPN) Output)

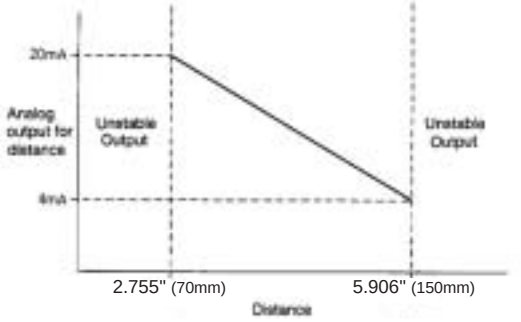


Connection Example (SA1M-CL4-AC/BC (PNP) Output)



Auxiliary Output

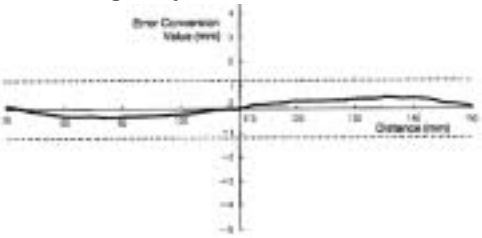
Analog Output for Distance vs. Distance Characteristics



1. *When the auxiliary output (analog output for distance) is used, the sensing distance should range from 70 to 150mm. If the sensing distance exceeds this range, an unstable output occurs.*

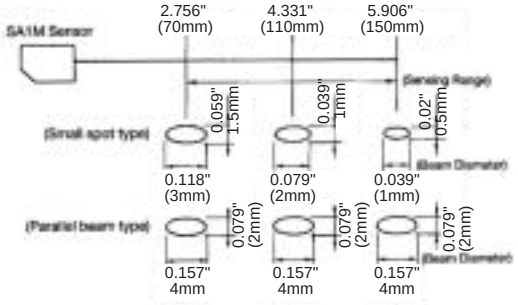
Linearity Error for Auxiliary Output

Analog Output for Distance

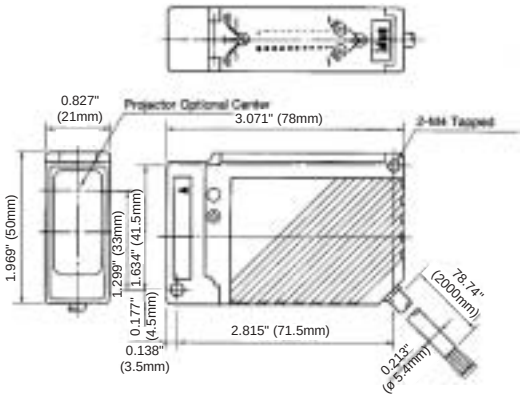


2. *IDEC's laser displacement sensor is ideal when highly accurate distance measurement is required. (Sensing range is 60 to 160mm.) Refer to the MX1C section on page M-26.*

Sensing Distance and Beam Distance



Dimensions



Q

Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Laser Safety Information

Installation: If a sensor is installed so that the laser beam may shine or reflect into the eyes of a person passing by or working in the vicinity, place an opaque sheet of material in front of the beam to prevent potential eye injury. For people working near a laser sensor, protective glasses which screen out a significant amount of the harmful radiation are recommended at all times.

All SA1M laser sensors also include a remote interlock terminal which can be used to turn the laser on or off with an external switch, as required, to operate the sensor safely from a remote location. To avoid exposure to harmful radiation, never disassemble a laser sensor.

WARNING: Do not allow class IIIa beams to shine directly into the eyes. Do not allow lasers to reflect from a glossy, shiny, or reflective surface into the eyes.





Labelling: IDEC laser sensors include **CDRH-approved** safety warnings shown on the right and below, in compliance with federal regulations of the **Center for Devices and Radiological Health**.



SA1M Laser Mark Sensor:
Class IIIa Laser (670Nm) Visible Beam



Warning Label (common)



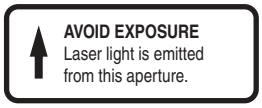
All Laser Sensors:
Identification and Certification

mfd.: **FEBRUARY 1997**
Product conforms to
21 CFR1040

Precaution Label



SA1M Visible Laser:
Aperture Warning



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MX1A and MX1B: Laser Displacement Detection Sensors

- Built-in math capabilities available (MX1B only)
- Digital display on amplifier; easy setting and monitoring (MX1B only)
- Miniature sensor head is compact for high-density installations
- Excellent linearity: ±0.0008" (or 20 µm) ±0.5% of displacement (MX1A-B; MX1B-B)
- High resolution sensing: 0.0004" or 10 µm = 10mV (MX1A-B; MX1B-B)
- Two sensing ranges: 1.18" to 1.97" (30 to 50mm) and 1.97" to 5.12" (50 to 130mm)
- MX1B can measure thickness or differences in surface levels when used in combination with another MX1A or MX1B
- The shape, size, color, and material of the object do not detract from accurate measurement (see Note 1 below)
- Delayed laser, remote interlock, power supply key switch, and laser LED are all included on the sensor head — these features ensure safe operation
- Mount the amplifier on a 1.378" (35mm) DIN rail





1. *Laser sensing of mirror-like surfaces is not recommended. For best results detecting reflective surfaces, tilt the sensor to reduce direct laser reflection. Sensing at a small angle (approximately ±10°) does not significantly reduce the sensing accuracy or linearity of the resulting analog output.*

2. ***Warning:** Class IIIb laser. Do not allow the laser to shine directly into the eyes. Always consider eye safety when installing a laser sensor. Make sure the laser beam cannot inadvertently shine into the eyes of people passing by or working in the vicinity. See laser safety information on page M-25.*

CE

General Specifications

Power Voltage	120V AC @ 50/60Hz
Allowable Range	85% to 110% of the rated voltage
Power Consumption	MX1A: 15VA, MX1B: 25VA
Dielectric Strength	Between terminal (except A.OUT, CAL OUT/IN, AG, and FG terminals) and housing: 1,500V AC, 1 minute
Insulation Resistance	Between terminal (except A.OUT, CAL OUT/IN, AG, and FG terminals) and housing: 100MΩ (minimum), with 500V DC megger
Operating Temperature	0°C to +50°C (performance will be adversely affected if the sensor becomes coated with ice)
Operating Humidity	45% to 85% RH (avoid condensation)
Storage Temperature	–20°C to +70°C
Vibration Resistance	Damage limits: 16.7Hz, 2G, 1 hour in each of 3 axes (when de-energized)
Shock Resistance	Damage limits: 100m/s^2 (approximately 10G), 3 shocks in each of 3 axes
Extraneous Light Immunity	Incandescent light: 3,000 lux (maximum), defined as incident or unwanted light received by a sensor, unrelated to the presence or absence of intended object
Material	Housing: diecast zinc; Filter and lens: acrylic; (sensor head only)
Degree of Protection	IP65 (sensor head only) — IEC Pub 529, sensors rated IP65 are dust-tight, water-resistant, and perform best when not subjected to particle or water blasts
Weight, Amplifier	MX1A: Approximately 2.0kg, MX1B: Approximately 2.5kg
Weight, Sensor Head	Short cable (P/N ends in "S"): Approximately 500g Long cable (P/N ends in "L"): Approximately 800g
Dimensions, Amplifier (HxWxD)	MX1A: 4.21" x 5.12" x 4.41" (107 x 130 x 112mm) MX1B: 4.21" x 6.69" x 4.41" (107 x 170 x 112mm)
Dimensions, Sensor Head (HxWxD)	1.73" x 0.73" x 1.79" (44 x 18.5 x 45.5mm)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: MX1A and MX1B Sensors

Part Number	Sensing Range	Resolution	Features	Sensor Head Cable Length
MX1A – A 12 R6S **MX1A – A 12 R6L**	1.97" to 5.12" (50 to 130mm)	0.002" (50 µm)	Display and calculation not available	16' – 4-7/8" (5m) 32' – 9-3/4" (10m)
MX1B – A 12 R6S **MX1B – A 12 R6L**			Display and calculation standard	16' – 4-7/8" (5m) 32' – 9-3/4" (10m)
MX1A – B 12 R6S **MX1A – B 12 R6L**	1.18" to 1.97" (30 to 50mm)	0.0004" (10 µm)	Display and calculation not available	16' – 4-7/8" (5m) 32' – 9-3/4" (10m)
MX1B – B 12 R6S **MX1B – B 12 R6L**			Display and calculation standard	16' – 4-7/8" (5m) 32' – 9-3/4" (10m)

IMPORTANT: The sensor head and amplifier are calibrated in pairs — use units with the same serial number together to avoid damage to the laser diode. Using different serial numbers together or making alterations to the sensor amplifier head or cable will void the factory warranty.

Functional Specifications

	MX1A-A, MX1B-A	MX1A-B, MX1B-B
Reference Sensing Distance	3.54" (90mm)	1.57" (40mm)
Detectable Sensing Range	±1.57" (40mm)	±0.39" (10mm)
Analog Offset	±1V (±0.16" or 4mm) zero adjustment range	±1V (±0.04" or 1mm) zero adjustment range
Analog Response Speed	Selectable: High-speed (F) = 1ms, Normal speed (S) = 20ms	
Analog Output, Measured	±10V DC, 10mA (maximum), measured analog output voltage is proportional to displacement as follows: 0.25V per mm (MX1A-A and MX1B-A), 1V per mm (MX1A-B and MX1B-B)	
Resolution*	0.002" (50 µm) = 12.5 mV	0.0004" (10 µm) = 10mV
Linearity	±0.004" (100 µm) ±0.5% of displacement	±0.0008" (20 µm) ±0.5% of displacement
Analog Input, Calculated (MX1B only)	Voltage range: ±10V DC; Impedance: 100kΩ, measured analog output from an MX1A or MX1B is used as the calculated analog input for the MX1B only; the calculated output voltage is proportional to the calculated values for the thickness or difference in levels: 0.25V per mm (MX1A-A and MX1B-A), 1V per mm (MX1A-B and MX1B-B)	
Analog Output, Calculated (MX1B only)	±10V DC, 10mA (maximum), measured analog output from an MX1A or MX1B is used as the calculated analog input for MX1B only; the calculated output voltage is proportional to the calculated values for the thickness or difference in levels: 6.35V per inch or 0.25V per mm (MX1A-A and MX1B-A), 25.32V per inch or 1V per mm (MX1A-B and MX1B-B)	
Digital Output	Transistor 30V DC, 0.1A/point (maximum), upper LED is lit when measured value > preset, lower LED is lit when < preset	
Digital Output Setting	Separate settings for upper and lower limits (infinite turn)	
Digital Output Response	Rise and fall: 500 µsec (maximum)	
Out LED	On: digital output turns on	
Upper and Lower LEDs	Upper LED on: Upper limit output turns on	Lower LED on: Lower limit output turns on
Enable Input (Synchronous)	Controls inspection output with synchronous signal (one coupler)	
Enable LED	On: For synchronous signal input	
Alarm Input **Alarm Output**	Using 2 units together: Main unit (MX1B only) takes the alarm output from the sub unit (MX1A or MX1B) Transistor 30V DC, 0.1A / pt. (maximum), alarm output is lit when alarm condition exists, as displayed by the alarm LEDs	
Alarm LEDs	Dark on: Reflected light is insufficient Far on: Detected distance > maximum	Bright on: Reflected light is excessive Near on: Detected distance < minimum
Calculation Over LED	On: Analog output (calculated) exceeds output range, MX1B only	
Alarm Input LED	On: When alarm input turns on, MX1B only (when using two units together)	
Power LED (on both amplifier and sensor head)	Green LED when power is on Orange LED when a laser is emitted during normal operation Laser beam emitted approximately 10 seconds after power-up; laser emission can be controlled while the power is on, using remote interlock provided	
Temperature Drift	±2 mV per °C (maximum)	
Frequency	11.3KHz	
Hysteresis	Selectable: Narrow (N) = 40 mV or wide (W) = 200 mV	
Light Source	Laser diode (780 nm)	
Receiving Element	PSD (position sensitive device)	

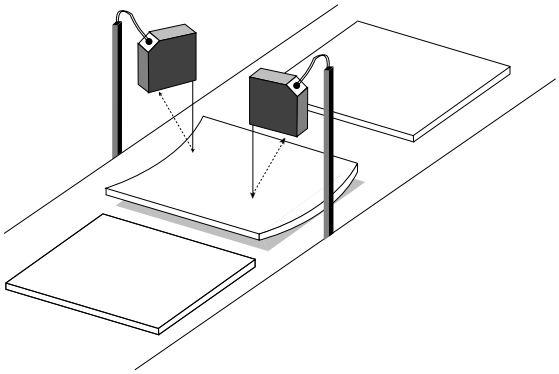
1. These specifications were developed from tests using a white ceramic object at the reference sensing distance, using the normal response speed at (20ms) 25ºC.

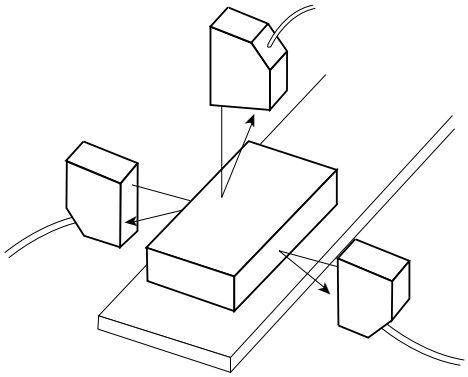
*2. * Peak to peak of analog output noise.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

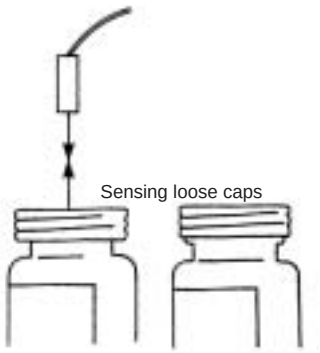
Applications

Checking for warped boards

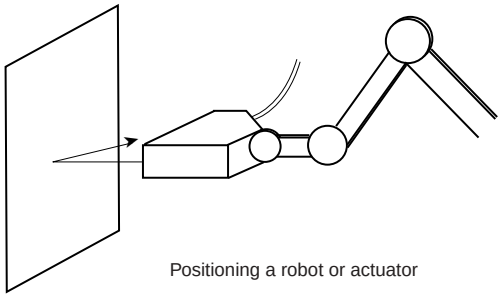




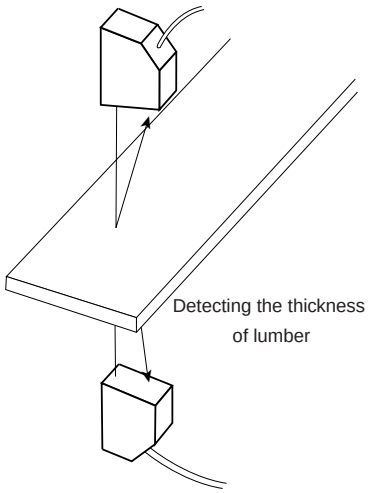
Detecting the height and width of wood or blocks



Sensing loose caps

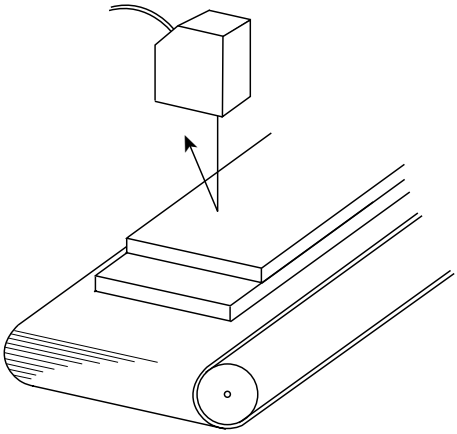


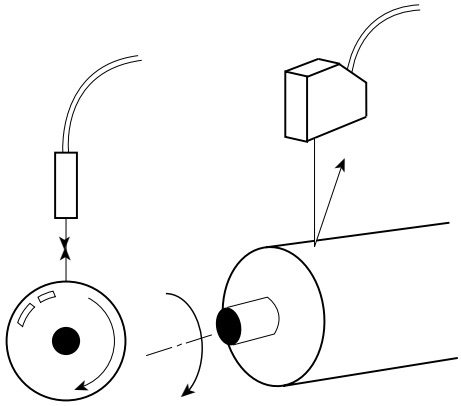
Positioning a robot or actuator



Detecting the thickness of lumber

Detecting overlapping sheets
Counting sheets of paper





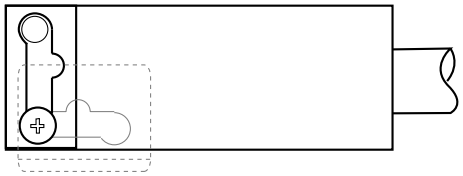
Sensing the roundness of a roller

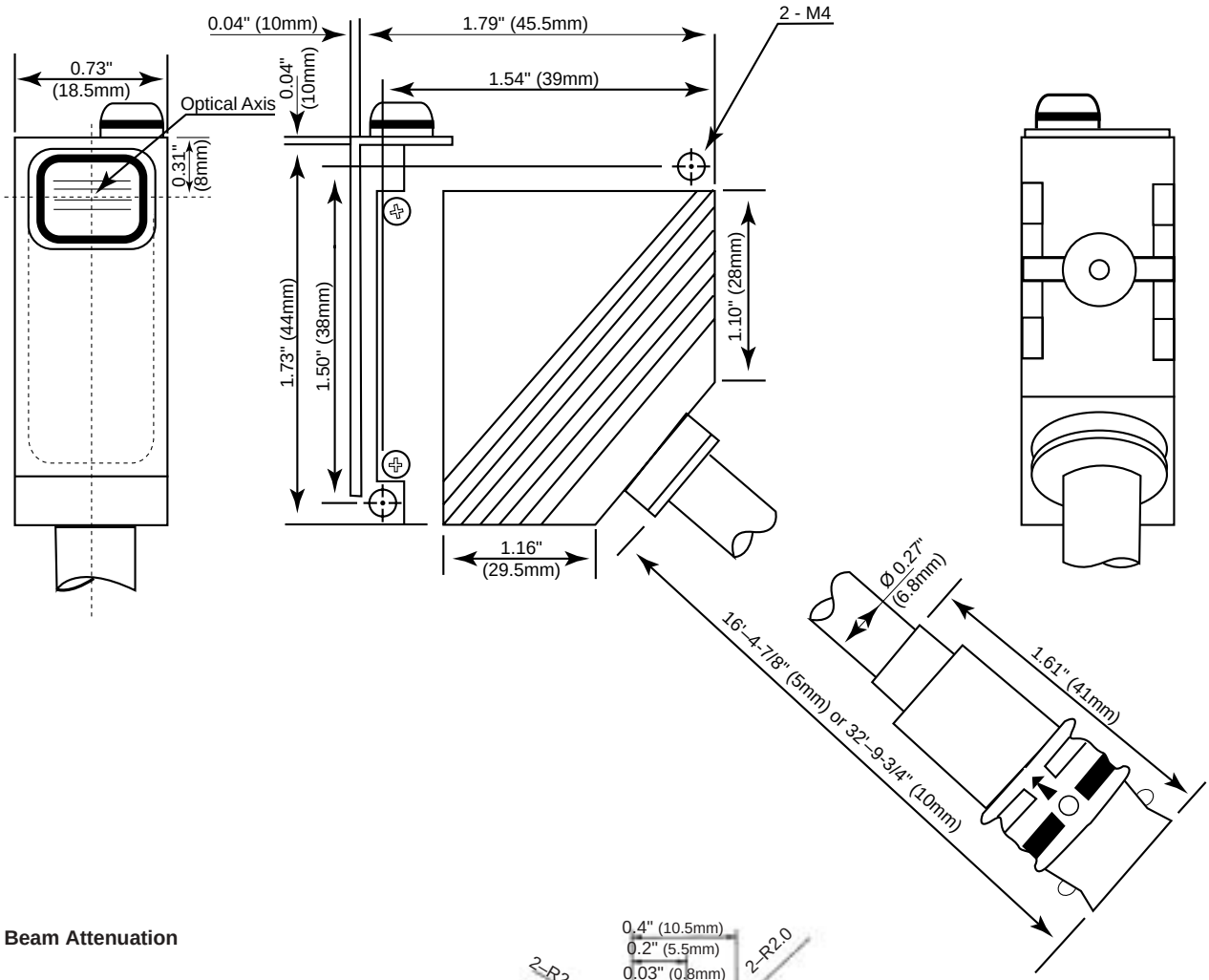
Q
Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

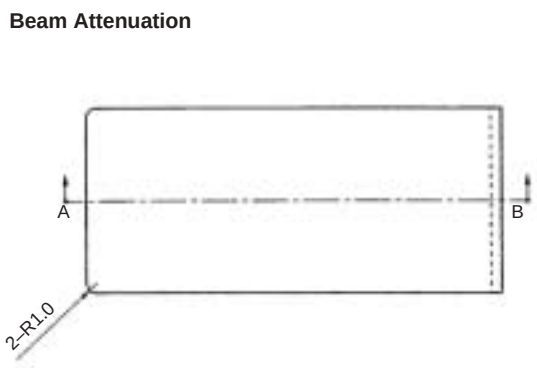
Dimensions

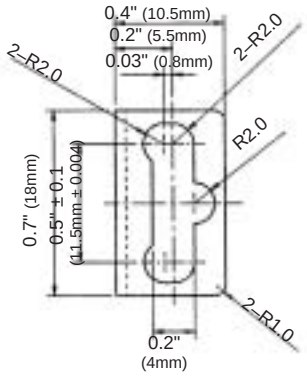
Sensor Head

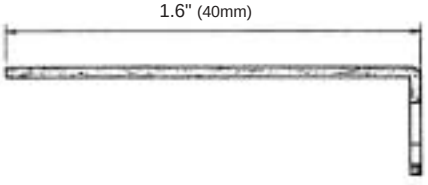




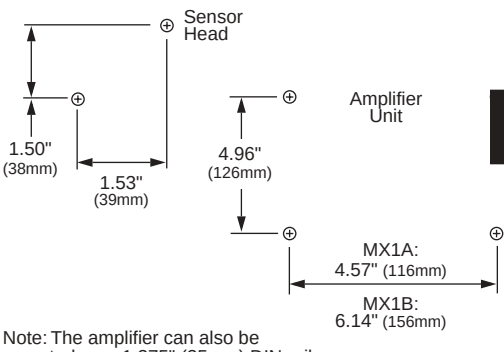
Beam Attenuation







Panel Cut-Out

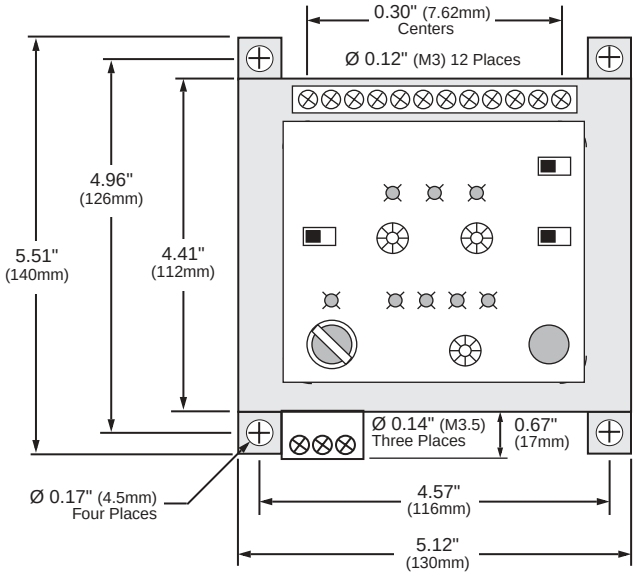


Note: The amplifier can also be mounted on a 1.375" (35mm) DIN rail.

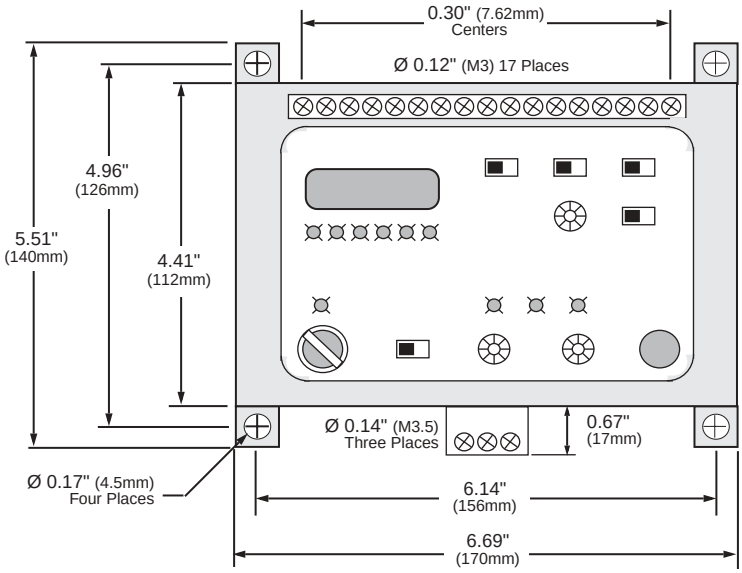
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

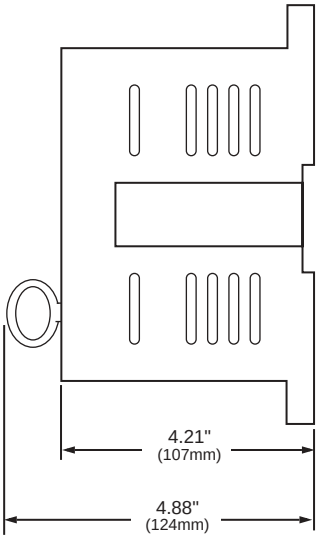
Dimensions, continued

MX1A Amplifier Unit



MX1B Amplifier Unit





Side View
Typical for
MX1A and
MX1B

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Laser Safety Information

Installation: If a sensor is installed so that the laser beam may shine or reflect into the eyes of a person passing by or working in the vicinity, place an opaque sheet of material in front of the beam to prevent potential eye injury. For people working near a laser sensor, protective glasses which screen out a significant amount of the harmful radiation are recommended at all times.

All laser sensors also include a remote interlock terminal which can be used to turn the laser on or off with an external switch, as required, to operate the sensor safely from a remote location. As required by law for all class IIIb lasers, the MX1A and MX1B sensors feature a safety key switch. For the MX1A and MX1B, an LED indicator is lit (green) upon laser transmission; 10 seconds later the LED changes color (amber) when the laser beam turns on.

To avoid exposure to harmful radiation, never disassemble a laser sensor.

WARNING: Do not allow class IIIa and IIIb laser beams to shine directly into the eyes. Do not allow lasers to reflect from a glossy, shiny, or reflective surface into the eyes.

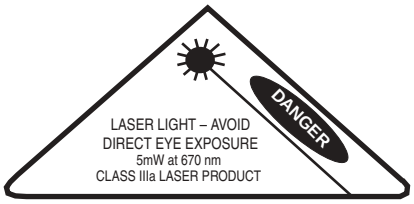




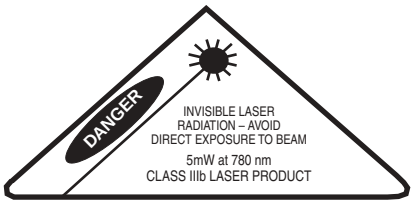
Labelling: IDEC laser sensors include **CDRH-approved** safety warnings shown on the right and below, in compliance with federal regulations of the **Center for Devices and Radiological Health**.



MX1C Miniature Laser Sensor:
Class IIIa Laser (670nm) Visible Beam



MX1A and MX1B Laser Sensors:
Class IIIb Laser (780nm) Invisible Beam



All Laser Sensors:
Identification and Certification

mfd.: **FEBRUARY 1997**
Product conforms to
21 CFR1040

MX1A/B Invisible Laser:
Aperture Warning

AVOID EXPOSURE –
Invisible laser radiation is emitted from this aperture.

MX1C Visible Laser:
Aperture Warning

AVOID EXPOSURE –
Laser light is emitted from this aperture.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MX1C: Self-Contained Laser Displacement Sensors

- Analog output (20 to 4mA) can be selected for continuous values; digital output (on/off) can be used; or both can be used together
- Miniature sensor head is compact for high-density installations
- Visible beam is easy to align with target
- Adjustable response speed
- Shape, size, color, and material do not detract from accurate measurement (see note)
- Wide sensing range: 2.36" to 6.30" (60mm to 160mm)
- A ten-dot dynamic display shows detected positions
- Alarm output indicates when sensing conditions may result in inaccurate results



1. *Laser sensing of mirror-like surfaces is not recommended. For best results detecting reflective surfaces, tilt the sensor to reduce direct laser reflection. Sensing at a small angle (approximately ±10°) does not significantly reduce sensing accuracy or linearity of resulting analog output.*
2. ***WARNING:** Class IIIa laser. Do not allow the laser to shine directly into the eyes. Always consider eye safety when installing a laser sensor. Make sure that the laser beam cannot inadvertently shine into the eyes of people passing by or working in the vicinity. See laser safety information on page Q-25.*

General Specifications	
Power Voltage	24V DC (ripple 10% maximum)
Current Draw	200mA (maximum)
Dielectric Strength	Between live and dead parts: 500V AC, 1 minute
Insulation Resistance	Between live and dead parts: 100MΩ (minimum), with 500V DC megger
Operating Temperature	0 to +45°C (performance will be adversely affected if the sensor becomes coated with ice)
Storage Temperature	–20°C to +70°C
Operating Humidity	35% to 85% RH (avoid condensation)
Vibration Resistance	Damage limits: 10 to 55Hz, amplitude 1.5mm p-p, 2 hours in each of 3 axes (when de-energized)
Shock Resistance	Damage limits: 100m/sec^2 (approximately 10G), 5 shocks in each of 3 axes
Extraneous Light Immunity	Incandescent light: 3,000 lux (maximum) — defined as incident or unwanted light received by a sensor, unrelated to the presence or absence of intended object
Material	Housing: diecast zinc; Filter: glass; Lens: acrylic; Rear cover: polyarylate
Degree of Protection	IP65 — IEC Pub 529; Sensors rated IP65 are dust-tight, water-resistant, and perform best when not subjected to heavy particle or water blasts
Cable	Cable type: 6-core cabtyre cable 0.3mm^2, 6' 6 3/4" (2m) long
Weight	Approximately 400g
Dimensions	1.97"D x 0.83"W x 3.07"D (50mm H x 21mm W x 78mm D)

Function Specifications	
Resolution	0.002" (50 µm) — measuring conditions: sensing a white ceramic object at the reference sensing distance (60mm) using the normal response speed (50ms) at 25˚C
Analog Output	20 to 4mA, 5V (maximum), fixed range
Digital Output	NPN or PNP transistor open collector: 30V DC, 100mA (maximum); Residual: 1V (NPN), 2V (PNP)
Alarm Output	NPN or PNP transistor open collector: 30V DC, 100mA (maximum); Residual: 1V (NPN), 2V (PNP)
Level Meter (ten-dot LED)	Analog: Represents analog output level according to the object distance Digital: Indicates preset position for near limit
Out LED	On: When digital output on
Laser Diode LED	On: While laser is emitted (LD ON), laser emits approximately 1 second after power-up
Alarm LED	On: When reflected light is insufficient
Digital Output	On: When object is within the near limit setting and beyond the close end of the sensing range (≥ 2.36" or 60mm from the sensor)
Digital Output Setting	Fine-tuning dial for near limit setting
Response Time	High-speed (F): 5ms (maximum); Normal speed (S): 50ms (maximum)
Detectable Object	Non-mirror-like surfaces
Analog Adjustment	0.20" (5mm) = 0.8mA using multi-turn dial
Linearity	±100 µm ±1% of displacement value, defined as how linear (i.e. accurate) the actual analog output is, with respect to distance
Hysteresis	0.039" (1mm), defined as the difference between the operating point and the release point
Temperature Drift	5 µA per °C with 1.97" (50mm) square white ceramic
Light Source Element	Visible laser diode (670nm), 5 mW laser
Receiver Element	PSD (position sensitive device)

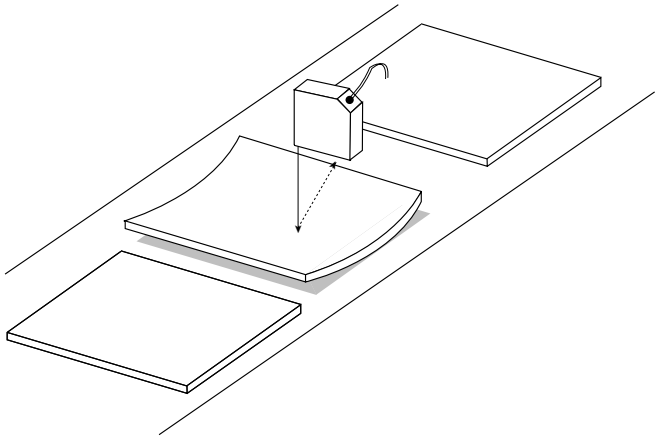
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

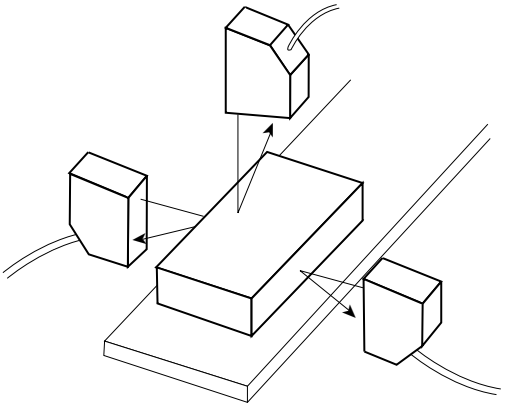
Part Numbers: MX1C Sensors

Part Number	Output	Sensing Range	Resolution
MX1C-AK1 **MX1C-AL1**	NPN PNP	2.36" to 6.30" (60mm to 160mm)	0.002" (50µm)

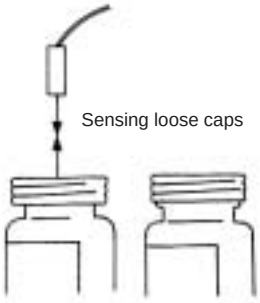
Applications

Checking for warped boards

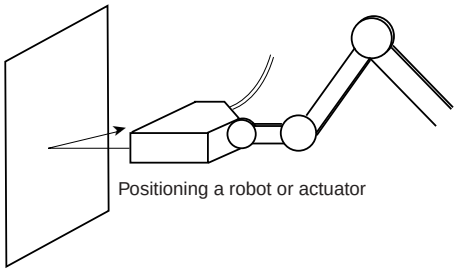




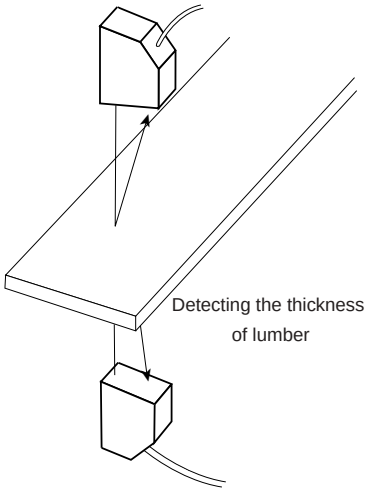
Detecting the height and width of wood or blocks



Sensing loose caps

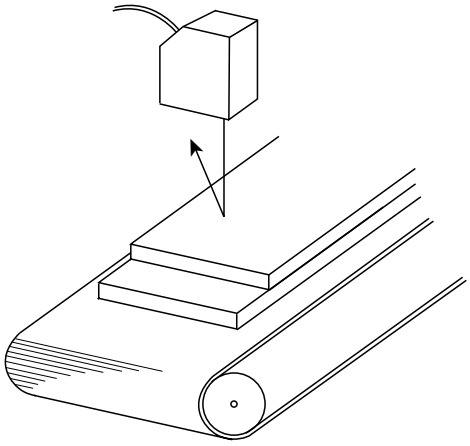


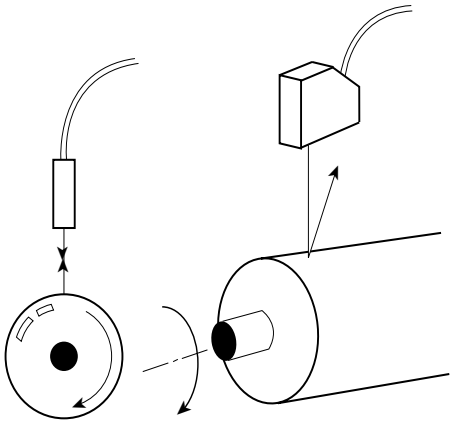
Positioning a robot or actuator



Detecting the thickness of lumber

Detecting overlapping sheets
Counting sheets of paper





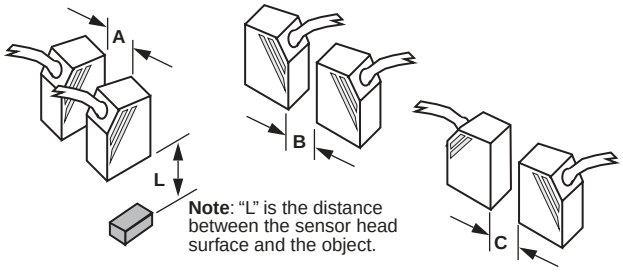
Sensing the roundness of a roller

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Installation

See page Q-65 for general sensor instructions. Below are considerations specific to the MX1C miniature laser sensors.

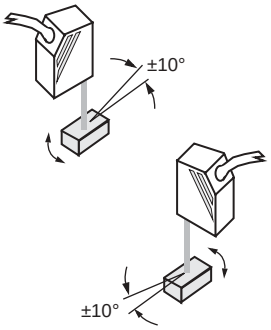
When installing multiple sensors, provide the recommended clearance as shown below, to prevent the interference of signals.



L	A	B	C
2.36" (60mm)	0	0	0
4.33" (110mm)	0	0.79" (20mm)	1.97" (50mm)
6.30" (160mm)	0.79" (20mm)	2.36" (60mm)	3.94" (100mm)

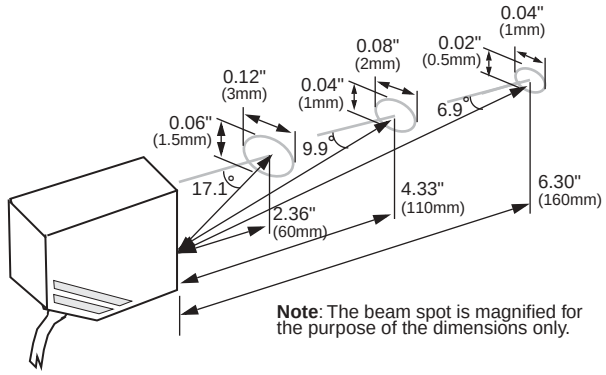
Laser sensing of mirror-like surfaces is not recommended, as the sensor receiver is designed for detecting diffuse-reflected light. Direct laser reflection may result in unreliable results.

For best results detecting reflective surfaces, tilt the sensor to reduce direct laser reflection. Sensing at a small angle (approximately ±10°) does not significantly reduce the sensing accuracy or linearity of the resulting analog output.



WARNING: Class IIIa laser. Do not allow the laser to shine directly into the eyes. Always consider eye safety when installing a laser sensor. Make sure laser beam cannot inadvertently shine into the eyes of people passing by or working in the vicinity. See laser safety information on page Q-25.

Projected Beam Characteristics



Due to the focusing characteristics of the lens, the projected beam of a laser sensor gets smaller (converges) from the near end to the far end of the sensing range. The beam gets larger (diverges) beyond the far end of the sensing range.

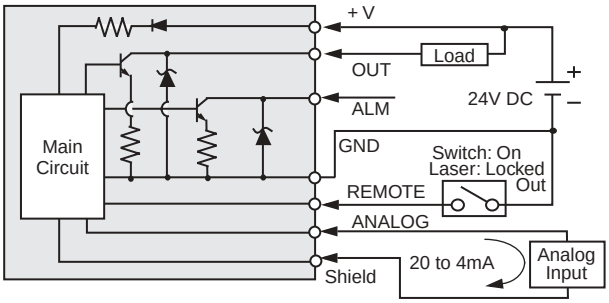
Wiring

Wire Color	Name	Function
Brown	+V	24V DC, 200mA (maximum)
Black	OUT	Digital Output, 30V DC, 100mA
Orange	ALM	Alarm Output, 30V DC, 100mA
Blue	GND	Power Ground (0 V)
White	ANALOG	Analog Output, 20 to 4mA
Peach	LD RMT	Remote Interlock On/Off Switch
Shield	A. GND	Analog Ground

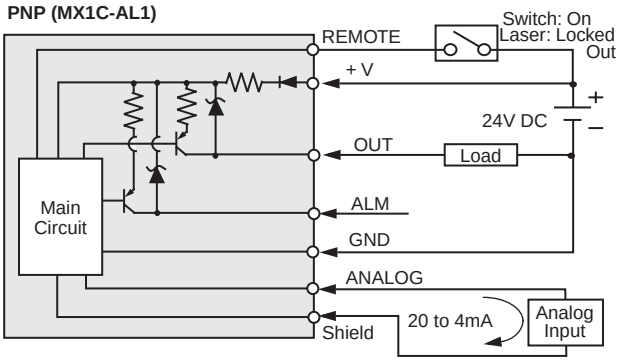
The analog output line may be extended up to 33' (10m), as long as the cable used is equal to or superior to the cable provided. Other lines may be extended up to 164' (50m), using #22 AWG (0.3mm^2) wire.

Schematics

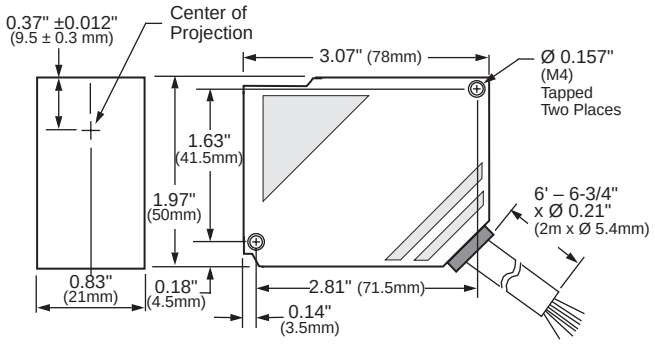
NPN (MX1C-AK1)



PNP (MX1C-AL1)



Dimensions



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA6A: Ultrasonic Analog Distance Detection Sensors

Key features of the SA6A include:

- Noise protection is available in two modes of operation
- Fuzzy logic eliminates the adverse effects of temperature fluctuation and air turbulence
- Hold mode is ideal for sensing liquid levels without the chatter often caused by surface ripples
- Three sensing ranges optimize resolution:
  Short range: 1.97" to 11.81" (± 0.04")
  Medium range:3.94" to 39.37" (± 0.08")
  Long range:7.87" to 78.74" (± 0.19")
- Shape, size, color, and material do not impair high-precision measurement
- Select analog output (4 to 20mA) for continuous values; use digital output (on/off); or use both
- An eight-dot LED meter provides a dynamic display of detected positions



General Specifications

Power Voltage	12 to 24V DC (ripple 10% maximum)
Current Draw	100mA (maximum)
Dielectric Strength	Between live and dead parts: 1000V, 50/60Hz, 1 minute
Insulation Resistance	Between live and dead parts: 100MΩ (minimum) with 500V DC megger
Operating Temperature	–10° to +60°C (performance will be adversely affected if the sensor becomes coated with ice)
Storage Temperature	–30°C to +70°C
Operating Humidity	35 to 70% RH (avoid condensation)
Vibration Resistance	Damage limits: 10 to 55Hz, amplitude 1.5mm p-p, 2 hours in each of 3 axes (when de-energized)
Shock Resistance	Damage limits: 500m/sec^2 (approximately 50G) 3 shocks in each of 3 axes
Noise Resistance	Power line: 500V; Pulse width: 1µsec, 50/60Hz (using a noise simulator)
Material	Housing: diecast zinc; Coverplate: polyarylate
Degree of Protection	IP65 — IEC Pub 529: Sensors rated IP65 are dust-tight, water-resistant, and perform best when not subjected to heavy particle or water blasts
Cable	Cable type: 6-core cabtyre cable 0.2mm^2, 6'–6-3/4" (2m) long
Weight	Short and medium range: 260g; Long range: 270g
Dimensions	Short and medium range: 1.96"H x 0.82"W x 3.19"D (50mm H x 21mm W x 81mm D) Long range: 3.19"H x 1.14"W x 3.33"D (50mm H x 29mm W x 84.5mm D)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: Short Sensing Range

Part Number	Output	Sensing Range (A Mode)	Sensing Range (B Mode)	Linearity/Resolution
SA6A-L1K4S **SA6A-L1L4S**	NPN PNP	3.94" to 11.81" ± 0.4" (100mm to 300mm ± 10mm)	1.97" to 11.81" ± 0.4" (50mm to 300mm ± 10mm)	± 0.04" (1mm)

Part Numbers: Medium Sensing Range

Part Number	Output	Sensing Range (A Mode)	Sensing Range (B Mode)	Linearity/Resolution
SA6A-LK4S **SA6A-LL4S**	NPN PNP	7.87" to 39.37" ± 0.8" (200mm to 1m ± 20mm)	3.94" to 39.37" ± 0.8" (100mm to 1m ± 20mm)	± 0.08" (2mm)

Part Numbers: Long Sensing Range

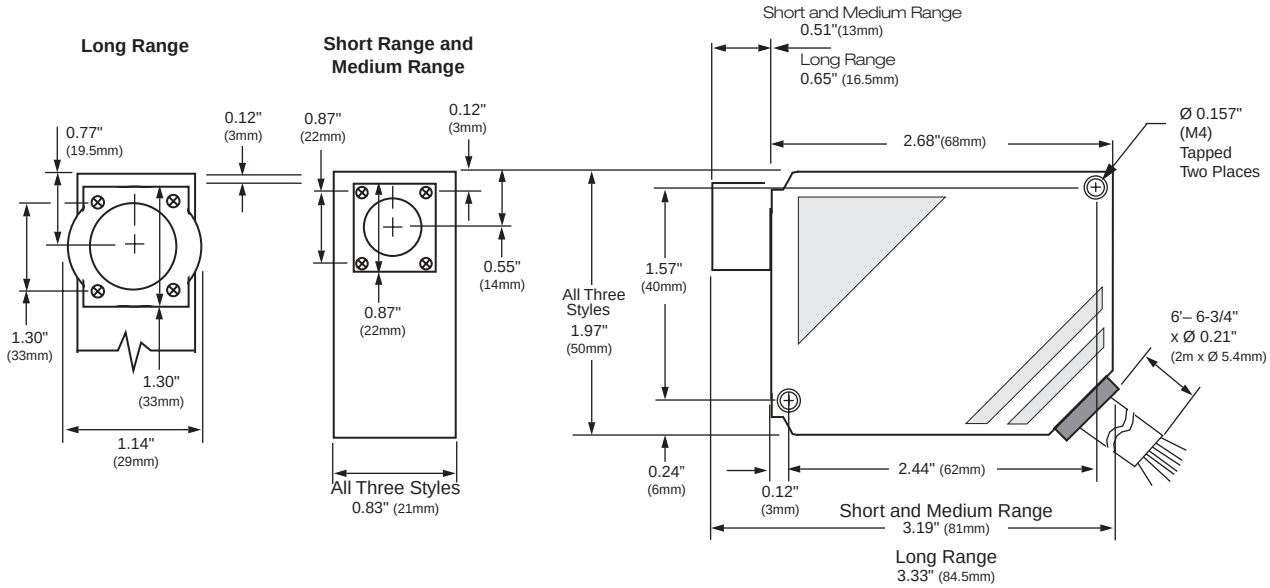
Part Number	Output	Sensing Range (A Mode)	Sensing Range (B Mode)	Linearity/Resolution
SA6A-L2K4S **SA6A-L2L4S**	NPN PNP	15.75" to 78.74" ± 1.6" (400mm to 2m ± 40mm)	7.87" to 78.74" ± 1.6" (200mm to 2m ± 40mm)	± 0.19" (5mm)

Function Specifications

	SA6A-L1K4S, -L1L4S	SA6A-LK4S, -LL4S	SA6A-L2K4S, -L2L4S
Analog Output	4 to 20mA (fixed range)	4 to 20mA (fixed range)	4 to 20mA (fixed range)
Error	± 0.08mA	± 0.04mA	± 0.05mA
	Defined as how accurate the actual analog output is, with respect to distance		
Resolution	± 0.04" (1mm)	± 0.08" (2mm)	± 0.19" (5mm)
	Defined as the smallest object or the shortest distance that can be detected with reliability		
Digital Output	NPN or PNP transistor open collector, 100mA, 30V DC (maximum); Residual: 1.5V (NPN), 2.5V (PNP)		
Alarm Output	NPN or PNP transistor open collector, 100mA, 30V DC (maximum); Residual: 1.5V (NPN), 2.5V (PNP)		
Level Meter	A or B mode: Represents analog output level on an 8-dot LED display, corresponding to object distance		
Out LED	On: When digital output is on (red LED)		
Power LED	On: When power is on (red LED)		
Alarm LED	On: When environment change occurs (red LED)		
Stable LED	On: When stable operation is ensured (green LED)		
Response: Normal Mode	Analog: 12Hz Digital (A mode): 22Hz Digital (B mode): 15Hz	Analog: 8Hz Digital (A mode): 15Hz Digital (B mode): 10Hz	Analog: 5Hz Digital (A mode): 10Hz Digital (B mode): 7Hz
Response: Fuzzy Mode	Analog/Digital: 4Hz	Analog/Digital: 3Hz	Analog/Digital: 2Hz
Response: Hold Mode	Analog/Digital: 4Hz	Analog/Digital: 3Hz	Analog/Digital: 2Hz
Response Time	Analog: 48ms Digital (A mode): 16ms Digital (B mode): 24ms	Analog: 70ms Digital (A mode): 24ms Digital (B mode): 36ms	Analog: 90ms Digital (A mode): 30ms Digital (B mode): 45ms
Internal Synchronous Mode	Two sensors synchronized, alternate oscillations prevent interference; response time is doubled		
External Synchronous Mode	Three or more sensors synchronized with timing pulse signal:		
	On/Off (A mode) ≥ 15ms On/Off (B mode) ≥ 20ms	On/Off (A mode) ≥ 20ms On/Off (B mode) ≥ 30ms	On/Off (A mode) ≥ 30ms On/Off (B mode) ≥ 45ms
Oscillation Frequency	Approximately 290kHz	Approximately 200kHz	Approximately 130kHz
Directivity	± 10° (half wave: -6 dB)	± 7° (half wave: -6 dB)	± 7° (half wave: -6 dB)
Temperature Characteristics	± 0.06% per °C (± 12 µA per °C)		
Hysteresis	0.24" (6mm)	0.39" (10mm)	0.79" (20mm)
	Defined as the difference between the operating point and the release point		

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1D: Analog Distance Detection Sensors

Key features of the SA1D include:

- Triangulation ensures high-precision when sensing the presence or position of objects
- Wide sensing range: 7.87" to 19.69" (200 to 500mm)
- Select analog output (20 to 4mA) for continuous values; use digital output (on/off); or use both together
- Far and near limits can be defined for detecting objects within a specified zone
- A ten-dot LED level meter provides a dynamic display of detected positions and also shows near and far settings
- Alarm output indicates when sensing conditions may result in inaccurate results



General Specifications	
Power Voltage	12 to 24V DC ± 10% (ripple 10% maximum)
Current Draw	100mA (maximum)
Dielectric Strength	Not specified due to capacitor grounding
Insulation Resistance	Not specified due to capacitor grounding
Operating Temperature	0° to +55°C (performance will be adversely affected if the sensor becomes coated with ice)
Operating Humidity	35 to 85% RH (avoid condensation)
Storage Temperature	–20° to +70°C
Vibration Resistance	Damage limits: 10 to 55Hz, amplitude 1.5mm p-p, 2 hours in each of 3 axes (power off)
Shock Resistance	Damage limits: 500m/sec^2 (approximately 50G), 5 shocks in each of 3 axes
Extraneous Light Immunity	Sunlight: 10,000 lux; Incandescent light: 3,000 lux (maximum) — defined as the incident or unwanted light received by a sensor, unrelated to the presence or absence of the intended object
Material	Housing: Diecast zinc; Filter and lens: Acrylic
Degree of Protection	IP65 — IEC Pub 529; sensors rated IP65 are dust-tight, water-resistant, and perform best when not subjected to heavy particle or water blasts
Cable	Cable type: 5-core cabtyre cable 0.2mm^2, 6'–6-3/4" (2m) long
Weight	Approximately 350g
Dimensions	2.68"H x 0.83"W x 1.97"D (68mm H x 21mm W x 50mm D)

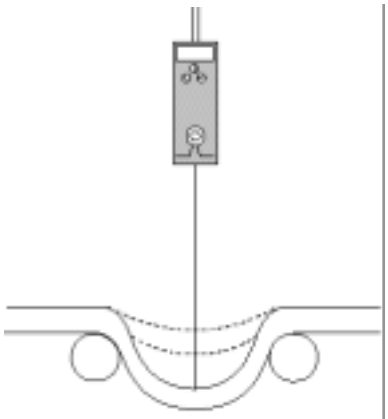
Function Specifications	
Analog Output	20 to 4mA, 5V (maximum), fixed range
Digital Output	NPN or PNP transistor open collector, 30V DC, 100mA (maximum), Residual: 1V (NPN), 2V (PNP)
Alarm Output	NPN or PNP transistor open collector, 30V DC, 100mA (maximum), Residual: 1V (NPN), 2V (PNP)
Level Meter (10-dot LED display)	Analog: Represents object distance corresponding to analog output on a 10-dot LED display Digital: Indicates near or far limit settings
Out LED	On: When digital output is on
Power LED	On: When power is on
Alarm LED	On: When reflected light is excessive or insufficient
Digital Output	Digital output and OUT LED turns on when object is within near and far limits
Digital Output Setting	14-turn control for far/near setting (far and near limits can be set separately)
Response Time	High-speed (F): 5ms (maximum) Normal speed (S): 50ms (maximum)
Repeat Error	High-speed: 4% (maximum) Normal speed: 2% (maximum)
Hysteresis	10% (maximum), defined as the difference between the operating point and the release point
Light Source Element	Infrared LED (modulation mode)
Wavelength	880 nm (infrared LED)
Receiver Element	Position sensitive device (PSD)
Detectable Object	Opaque

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

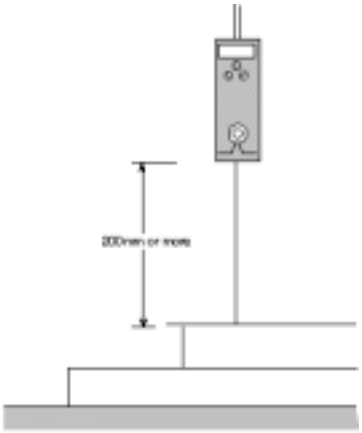
Part Numbers: SA1D Sensors

Part Number	Output	Sensing Range	Reference Object
SA1D-LK4	NPN	7.87" to 19.69" (200mm to 500mm)	White: 2.95" x 2.95" (75mm x 75mm)
SA1D-LL4	PNP	7.87" to 19.69" (200mm to 500mm)	

Applications

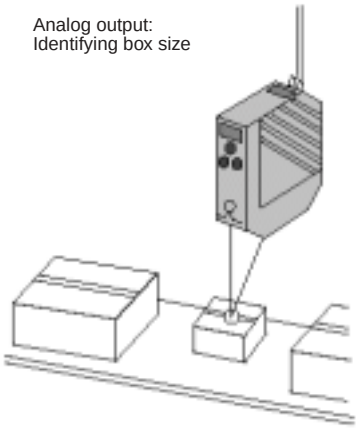


Analog output: Controlling tension

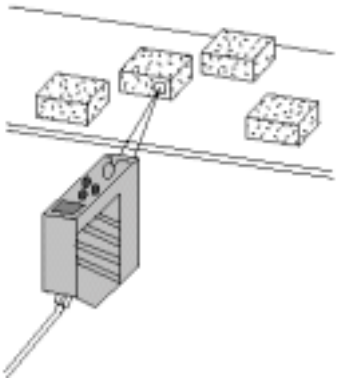


Comparison output: Detecting overlap

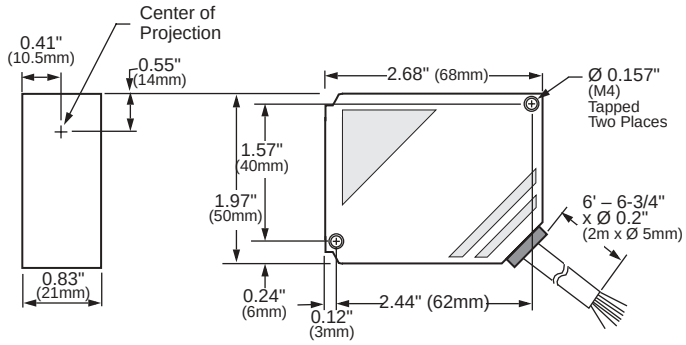
Analog output:
Identifying box size



Comparison or analog output:
Sensing object zone



Dimensions



Wiring

Wire Color	Name	Function
Brown	+V	12 to 24V DC, 100mA (maximum)
Black	OUT	Digital Output, 30V DC, 100mA
Orange	ALM	Alarm Output, 30V DC, 100mA
Blue	GND	Power Ground (0 V)
White	ANALOG	Analog Output, 20 to 4mA
Shield	GND	Shield

An analog output line may be extended up to 33' (10m), as long as the cable used is equal to or superior to the cable provided. Other lines may be extended up to 164' (50m), using #22 AWG (0.3mm^2) wire.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1E: Photoelectric Switches

Simple, compact design for world-wide usage.

Key features of the SA1E photoelectric sensor include:

- Four sensing methods
- Cable types and M8 connector types available
- NPN output, PNP output, light ON, dark ON options
- Long sensing ranges, high speed response
- CE marked



General Specifications

			Through-beam Type	Polarized Retroreflective Type	Diffuse-reflective Type	Small-beam Reflective Type
Cable Type	NPN output	Light ON	**SA1E-TN1**	**SA1E-PN1**	**SA1E-DN1**	**SA1E-NN1**
		Dark ON	**SA1E-TN2**	**SA1E-PN2**	**SA1E-DN2**	**SA1E-NN2**
	PNP output	Light ON	**SA1E-TP1**	**SA1E-PP1**	**SA1E-DP1**	**SA1E-NP1**
		Dark ON	**SA1E-TP2**	**SA1E-PP2**	**SA1E-DP2**	**SA1E-NP2**
Connector Type	NPN output	Light ON	**SA1E-TN1C**	**SA1E-PN1C**	**SA1E-DN1C**	**SA1E-NN1C**
		Dark ON	**SA1E-TN2C**	**SA1E-PN2C**	**SA1E-DN2C**	**SA1E-NN2C**
	PNP output	Light ON	**SA1E-TP1C**	**SA1E-PP1C**	**SA1E-DP1C**	**SA1E-NP1C**
		Dark ON	**SA1E-TP2C**	**SA1E-PP2C**	**SA1E-DP2C**	**SA1E-NP2C**
Applicable Standard			IEC606947-5-2			
Rated Operational Voltage			12 to 24V DC			
Operating Limits			10 to 30V DC			
Rated Insulation Voltage			30V DC			
Power Consumption / Current Draw			Emitter: 15 mA Receiver: 20 mA	30 mA		
Sensing Range			10 m	2.5 m (IAC-R5) 1.5 m (IAC-R6) (Note) 1 m (IAC-RS1)	700 mm (using 200 × 200 mm white matt paper)	50 to 150 mm (using 100 × 100 mm white matt paper)
Detectable Object			Opaque		Opaque/Transparent	
Hysteresis			—		20% maximum	
Response Time			1 ms maximum			
Sensitivity Control			Adjustable using a potentiometer (approx. 260°)			
Light Source Element			Infrared LED	Red LED	Infrared LED	Red LED
Operation Mode			Light ON/Dark ON			
Control Output			NPN open collector/PNP open collector 30V DC, 100 mA maximum Voltage drop: 1.2V maximum Short-circuit protection			
LED Indicators			Operation LED: Yellow Stable LED: Green Power LED: Green (Through-beam type emitter)			
Interference Prevention			—	Two units can be mounted close together		
Degree of Protection			IP67 (IEC60529)			

1. Maintain at least 100 mm clearance between the SA1E photoelectric switch and reflector. Reflectors are not attached to the photoelectric switch and must be ordered separately.
2. Standard cable length for cable type is 1 meter. Contact IDEC for longer cable lengths.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

			Through-beam Type	Polarized Retroreflective Type	Diffuse-reflective Type	Small-beam Reflective Type
General Specifications con't	Extraneous Light Immunity		Sunlight: 10,000 lux maximum, Incandescent lamp: 3,000 lux maximum (at receiver)			
	Operating Temperature		–25 to + 55°C (no freezing)			
	Operating Humidity		35 to 85% RH (no condensation)			
	Storage Temperature		–40 to +70°C (no freezing)			
	Insulation Resistance		Between live and dead parts: 20 MΩ maximum (500V DC megger)			
	Dielectric Strength		Between live and dead parts: 1000V AC, 50/60 Hz, 1 minute			
	Vibration Resistance		Damage limits: 10 to 55 Hz, Amplitude 0.75 mm p-p, 20 cycles in each of 3 axes			
	Shock Resistance		Damage limits: 500 m/s^2, 10 shocks in each of 3 axes			
	Material		Housing: PC/PBT, Lens: PC (Polarized retroreflective type: PMMA), Indicator cover: PC			
	Accessories Included		Instruction sheet, Sensitivity control screwdriver			
	Weight (approx)	Cable Type	Emitter: 30g Receiver: 30g	30 g		
		Connector Type	Emitter: 10g Receiver: 10g	10 g		
	Connection Method	Cable Type	ø3.5 mm, 3-core, 0.2 mm^2, 1-m vinyl cabtyre cable (2-core for the emitter of through-beam type)			
		Connector Type	M8 connector (4-pin)			

SA1E Accessories

Mounting Brackets

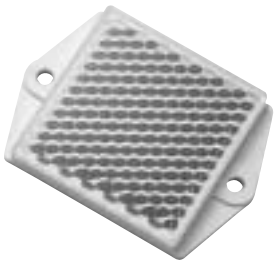
Part Number	Type	Package Quantity
SA9Z-K01	Vertical	1
SA9Z-K02	Horizontal	

Connector Cable for connector type

Part Number	Core Wires	Type & Length	Package Quantity
SA9Z-CM8K-4S2	4	Straight, 2m	1
SA9Z-CM8K-4L2		Right angle, 2m	
SA9Z-CM8K-4S5		Straight, 5m	
SA9Z-CM8K-4L5		Right angle, 5m	

Reflectors for polarized retroreflective type

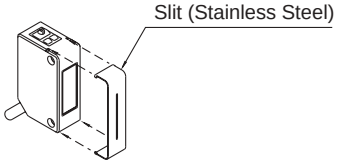
Part Number	Type	Package Quantity	Type & Length	Applicable Mounting Bracket
IAC-R5	Standard	1	Straight, 2m	IAC-L2
IAC-R6	Small		Right angle, 2m	IAC-L3
IAC-RS1	Tape type		Straight, 5m	—



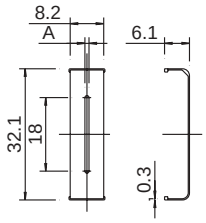
Slits for through-beam type

Part Number	Slit Width	Package Quantity	Sensing Range (m)		Maximum Detectable Object Width (mm)	
			One side	Both sides	One side	Both sides
SA9Z-S06	0.5 mm	2	2.5	1.0	7.0	0.5
SA9Z-S07	1.0 mm		3.5	1.5	7.0	1.0
SA9Z-S08	2.0 mm		6.0	3.5	7.0	2.0

The slit can be pressed to fit on the front easily in one touch.



Dimensions



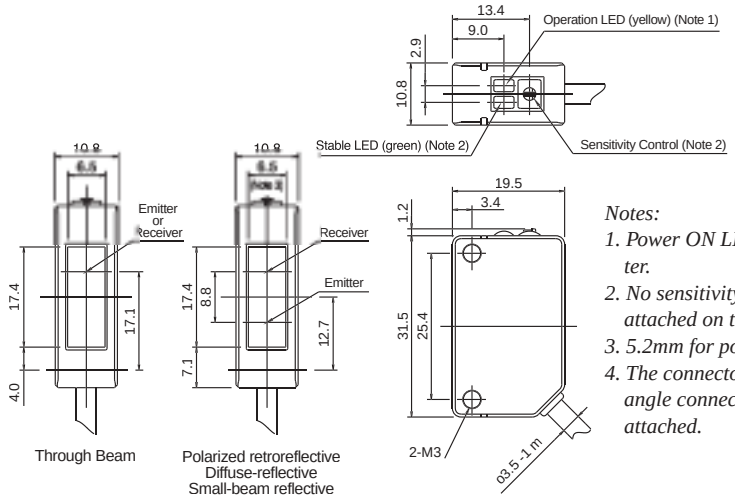
Q Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions

Cable Type



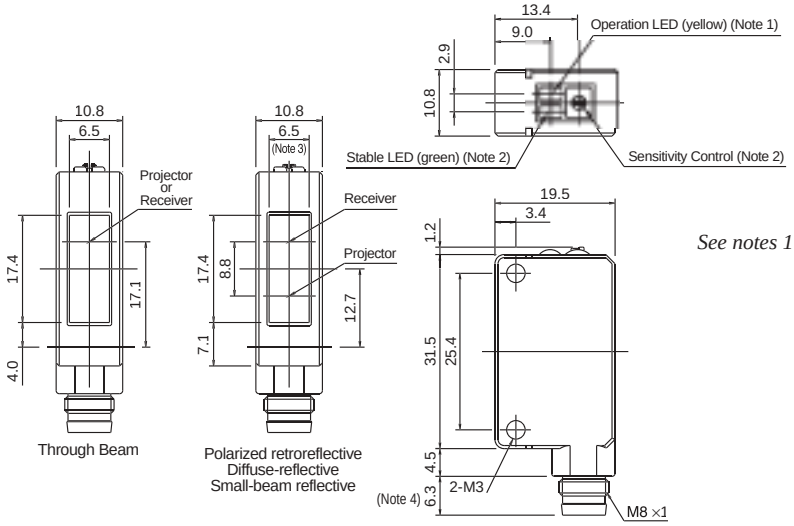


Notes:

1. *Power ON LED (green) for through-beam emitter.*
2. *No sensitivity control and stable LED are attached on the through-beam emitter.*
3. *5.2mm for polarized retroreflective type.*
4. *The connector length is 18mm when a right-angle connector cable (SA9Z-CM8K-4L) is attached.*

Connector Type

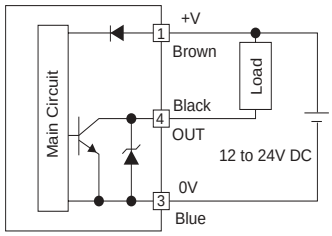




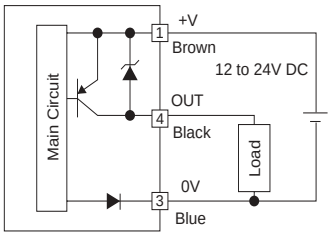
See notes 1 through 4 above.

Output Circuit and Wiring Diagram

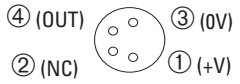
• NPN Output



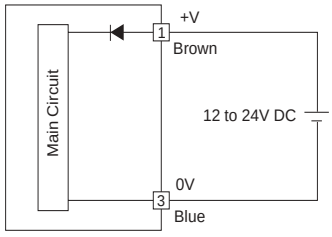
• PNP Output



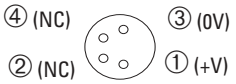
Connector Pin Assignment



• Through-beam Type Emitter



Connector Pin Assignment



Q

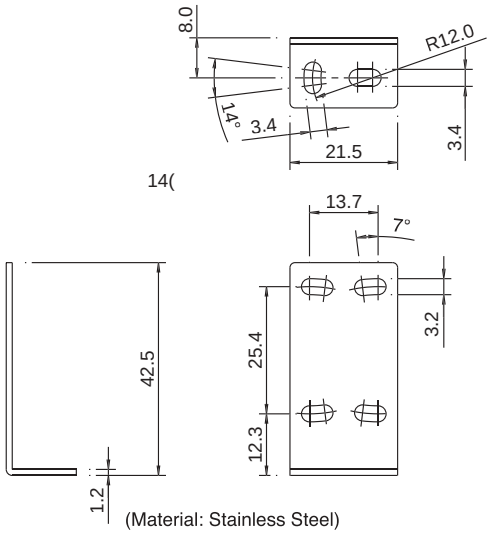
Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions, continued

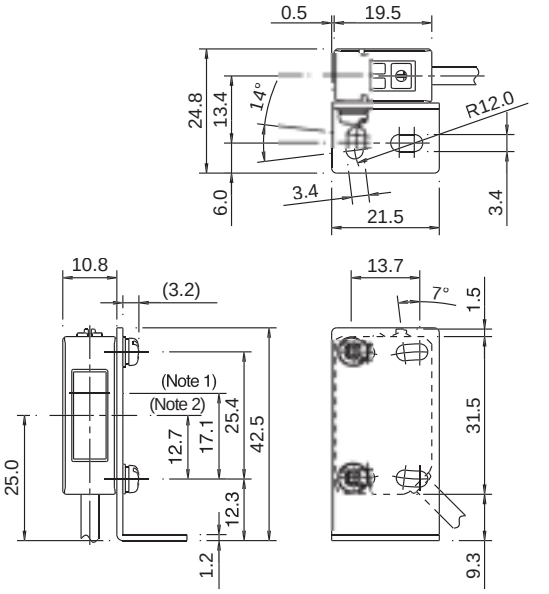
Mounting Bracket

SA9Z-K01



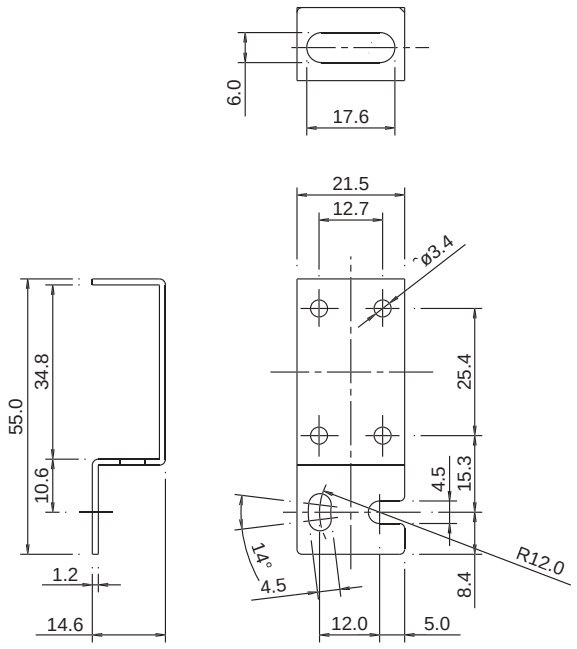
(Material: Stainless Steel)

With Mounting Bracket



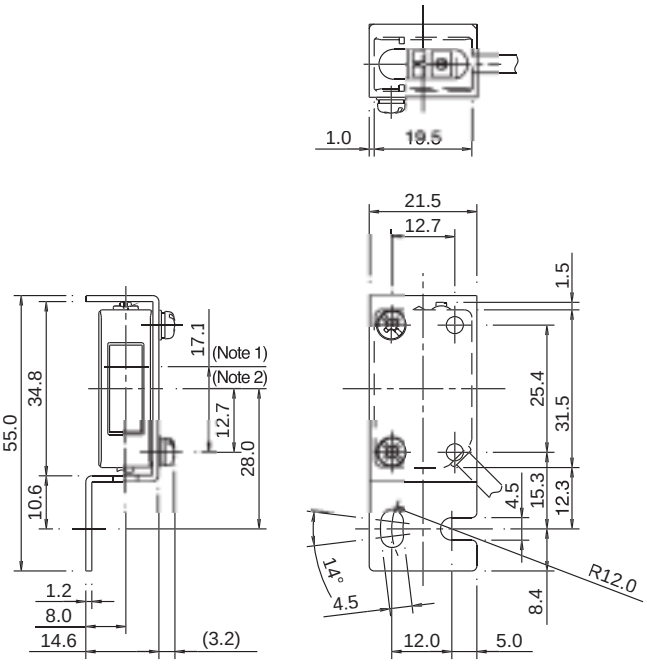
Note 1: Center of optical axis (through-beam type)
Note 2: Center of optical axis (polarized retroreflective, diffuse reflective, and small-beam reflective type)

SA9Z-K02



(Material: Stainless Steel)

With Mounting Bracket



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

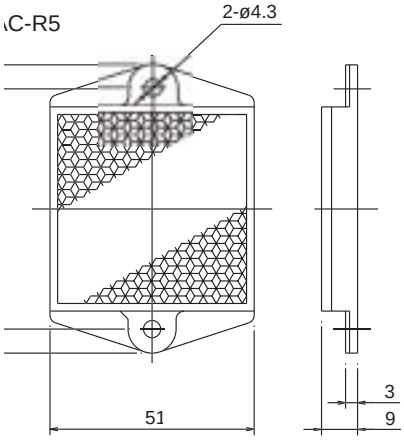
Q Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions, continued

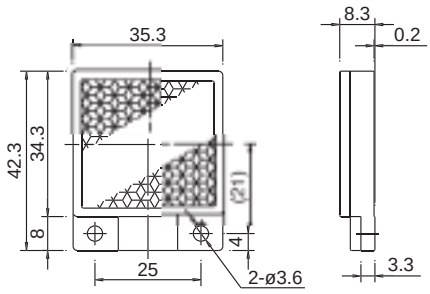
Reflector

IAC-R5



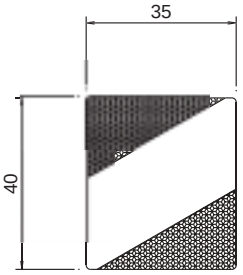
(Effective reflecting area: 47.2 × 47.2 mm)

IAC-R6



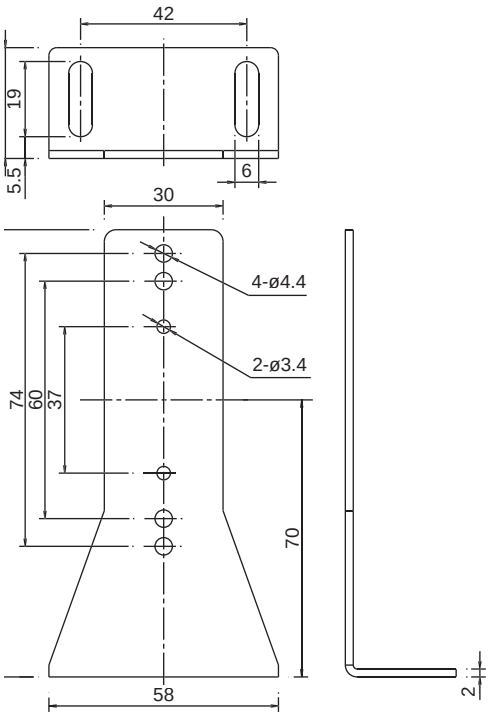
(Effective reflecting area: 30 × 31 mm)

IAC-RS1



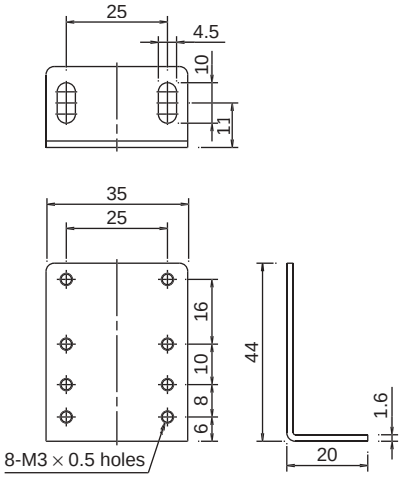
Reflector Mounting Bracket

AC-L2



Material: SPCC (zinc chromate plating, black)

IAC-L3

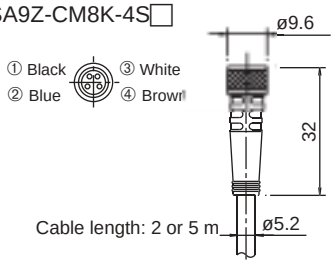


Material: SPCC (zinc plating)

Connector Cable (one-side connector)

Straight Type

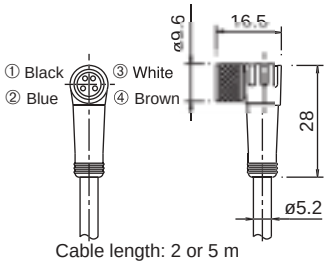
SA9Z-CM8K-4S□



Note: Dielectric strength when installed on the switch
Between live part and mounting bracket: 1000V AC (except between live part and clamping ring)

Right-angle Type

SA9Z-CM8K-4L□



Note: Dielectric strength when installed on the switch
Between live part and mounting bracket: 1000V AC (except between live part and clamping ring)

Q

Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1C-FK: Fiber Optic Analog Photoelectric Sensors

- High-speed, miniature photoelectric sensors with analog (4mA to 20mA) and digital output
- Senses gradual color changes
- Available in both red and 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
- Dozens of coordinating fiber optic units available to address specific application needs
- Simple to install and program
- IP66 protection rating



CE

General Specifications	SA1C-FK3	SA1C-FK3G
Light Source Element	Red LED	Green LED
Sensing Distance	Depends on the fiber unit (see pages 40–42)	
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	
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	
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	Cable type: Ø4.4mm 5-core vinyl cabtyre cable 0.2mm^2, 6'–6-3/4" (2m) long	
Material	Housing: Polybuthylenterephtalate (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%).*
2. *Use the attached resistor (249Ω, 1/4W) as a load resistance for converting analog output to voltage.*
3. *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.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA1C-FK Sensors

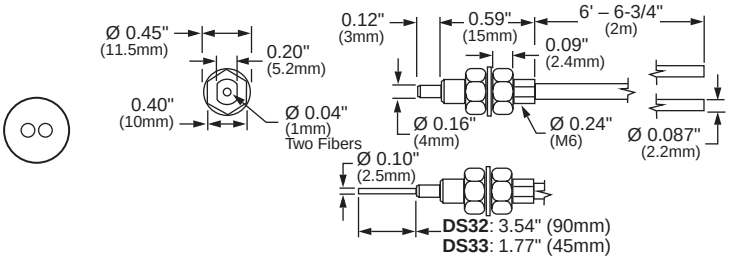
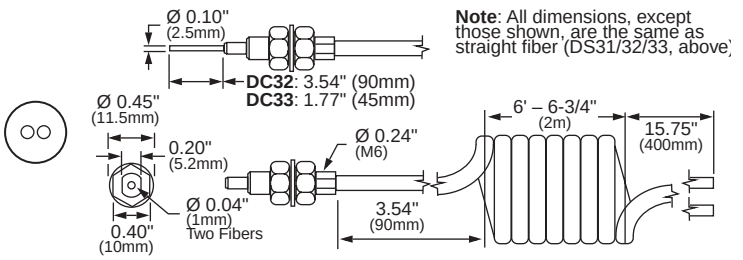
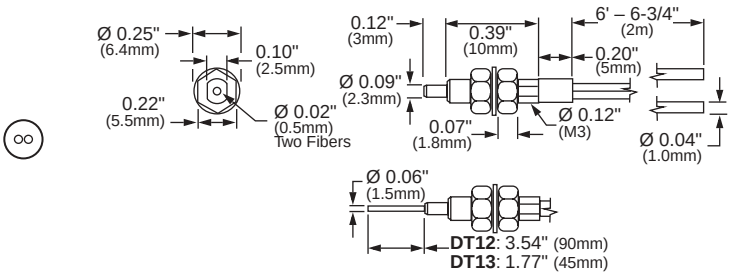
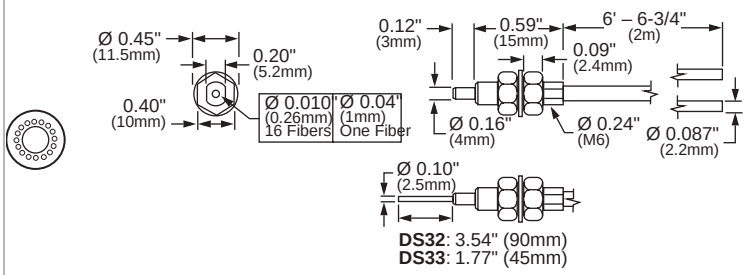
Part Number	Light Source Element	Output
SA1C-FK3	Red LED	Analog output + NPN output (with short-circuit)
SA1C-FK3G	Green LED	

Ordering Details

The SA1C-FK series consists of the amplifier/receiver only. Fiber optic units must be ordered separately using part numbers beginning with SA9F. SA1C-FK amplifier/receivers can be used with either through-beam or diffuse-reflected fiber optic units.

The fiber optic cord is 6'–6-3/4" (2m) long. Fiber optic cords can be cut to the desired length using a fiber cutter, except for heat-resistant glass fiber cords. A fiber cutter is included with fiber optic units (order SA9Z-F01 separately for replacement). A set of two easy-insert adaptors is included with the following fiber optic units: SA9F-TT, SA9F-TL, SA9F-DT, and SA9F-DL (order SA9Z-F02 for replacement set).

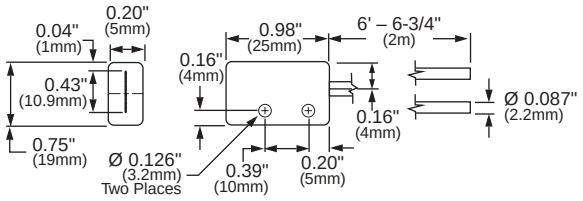
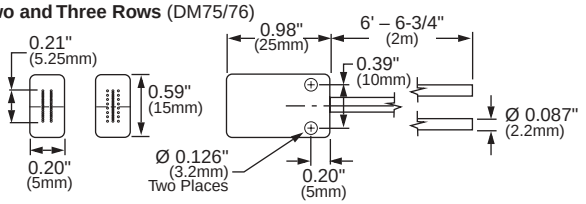
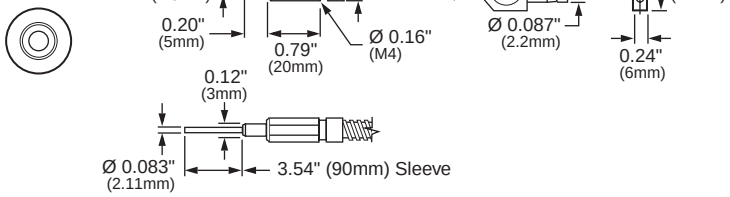
Part Numbers: SA9F Diffuse-Reflected Light Fiber Optic Units

Part Number	Description	Amplifier	Range	Dimensions
SA9F-DS31 No sleeve **SA9F-DS32** 3.54" (90mm) sleeve **SA9F-DS33** 1.77" (45mm) sleeve	Straight: Two fibers Ø 0.04" (1mm) Threaded mount: Ø 0.24" (M6) Detects: Ø 0.0012" (0.03mm) minimum object	SA1C-FK3 SA1C-FK3G	2.36" (60mm) 0.28" (7mm)	
SA9F-DC31 No sleeve **SA9F-DC32** 3.54" (90mm) sleeve **SA9F-DC33** 1.77" (45mm) sleeve (All three not compatible with green LED)	Coiled: Two fibers Ø 0.04" (1mm) Threaded mount: Ø 0.24" (M6) Detects: Ø 0.0012" (0.03mm) minimum object	SA1C-FK3 SA1C-FK3G	0.98" (25mm) —	
SA9F-DT11 No sleeve **SA9F-DT12** 3.54" (90mm) sleeve **SA9F-DT13** 1.77" (45mm) sleeve (All three not compatible with green LED)	Straight: Two fibers Ø 0.02" (0.5mm) Threaded mount: Ø 0.12" (M3) Detects: Ø 0.0012" (0.03mm) minimum object	SA1C-FK3 SA1C-FK3G	0.78" (20mm) —	
SA9F-DD31	Coaxial: Core Ø 0.04" (1mm) + 16 fibers: Ø 0.01" (0.26mm) Threaded mount: Ø 0.24" (M6) Detects: Ø 0.0012" (0.03mm) minimum object	SA1C-FK3 SA1C-FK3G	2.36" (60mm) 0.28" (7mm)	

(continued on following page)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA9F Diffuse-Reflected Light Fiber Optic Units, continued

Part Number	Description	Amplifier	Range	Dimensions
SA9F-DM74 1 row = 32 fibers **SA9F-DM75** 2 rows = 16 each (Not compatible with green LED) **SA9F-DM76** 3 rows = 16 center + 8 fibers each side (Not compatible with green LED)	Multicore: 32 fibers Ø 0.010" (0.26mm) Detects: Ø 0.0024" (0.06mm) minimum object	SA1C-FK SA1C-FK3G (not compatible with SA9F-DM75, SA9F-DM76)	2.36" (60mm) 0.16" (4mm)	**One Row** (DM74)  **Two and Three Rows** (DM75/76) 
SA9F-DH21 No sleeve **SA9F-DH22** 3.54" (90mm) sleeve (Both not compatible with green LED)	Heat-resistant glass: Two fibers Ø 0.03" (0.7mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.0012" (0.03mm) minimum object	SA1C-FK3 SA1C-FK3G	1.06" (27mm) —	

Measuring Conditions

Amplifier = Applicable Amplifier

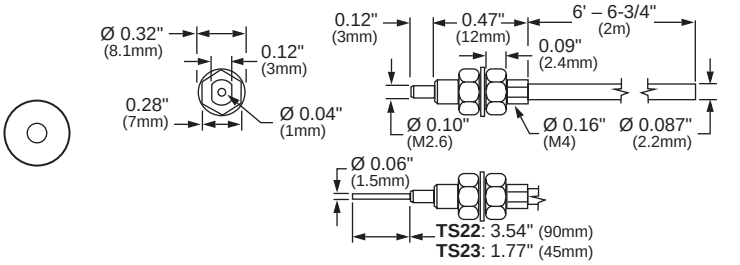
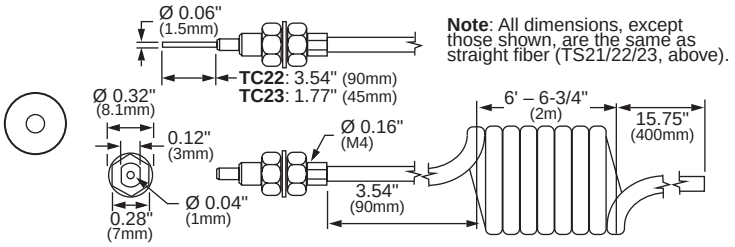
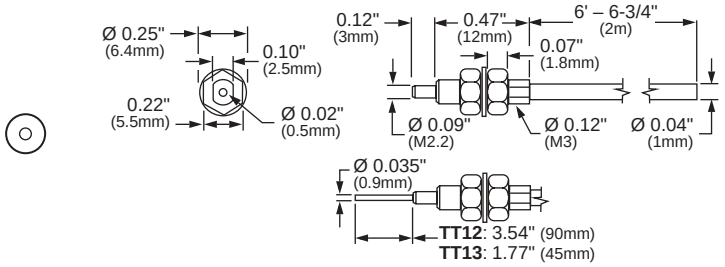
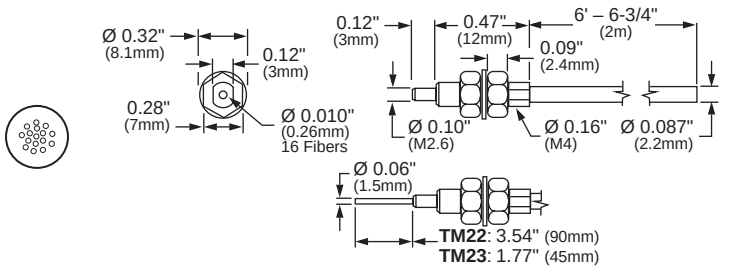
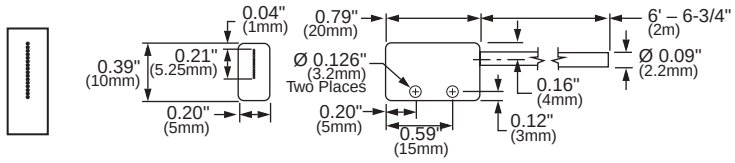
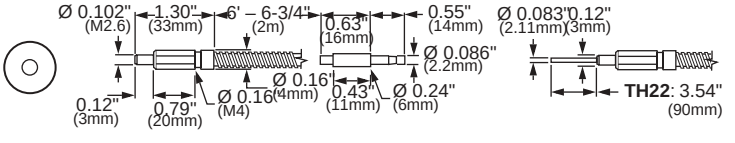
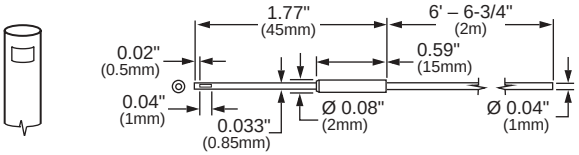
Range = Sensing Range
Sensing a 50 x 50mm piece of white paper

Minimum detectable object:
Sensing a copper-stranded wire with the SA1C-FK3

The sensing range varies depending upon the sensing conditions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA9F Through-Beam Fiber Optic Units

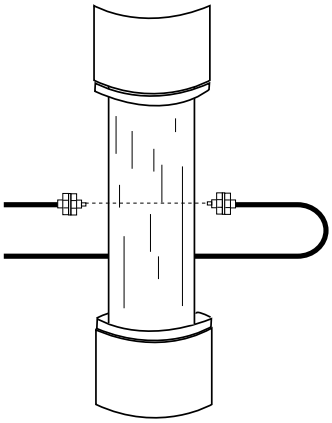
Part Number	Description	Amplifier	Range	Dimensions
SA9F-TS21 No sleeve **SA9F-TS22** 3.54" (90mm) sleeve **SA9F-TS23** 1.77" (45mm) sleeve	Straight fiber: Ø 0.04" (1mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.012" (0.3mm) minimum object	SA1C-FK3 SA1C-FK3G	7.09" (180mm) 0.63" (16mm)	
SA9F-TC21 No sleeve **SA9F-TC22** 3.54" (90mm) sleeve **SA9F-TC23** 1.77" (45mm) sleeve	Coiled fiber: Ø 0.04" (1mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.012" (0.3mm) minimum object	SA1C-FK3 SA1C-FK3G	5.91" (150mm) 0.55" (14mm)	
SA9F-TT11 No sleeve **SA9F-TT12** 3.54" (90mm) sleeve **SA9F-TT13** 1.77" (45mm) sleeve	Straight fiber: Ø 0.02" (0.5mm) Threaded mount: Ø 0.12" (M3) Detects: Ø 0.006" (0.15mm) minimum object	SA1C-FK3 SA1C-FK3G	1.97" (50mm) 0.2" (5mm)	
SA9F-TM21 No sleeve **SA9F-TM22** 3.54" (90mm) sleeve **SA9F-TM23** 1.77" (45mm) sleeve	Multicore: 16 fibers (cluster) Ø 0.010" (0.26mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.012" (0.3mm) minimum object	SA1C-FK3 SA1C-FK3G	5.91" (150mm) 0.55" (14mm)	
SA9F-TM74 16 fibers in one row	Multicore: 16 fibers (one row) Ø 0.010" (0.26mm) Detects: Ø 0.0024" (0.06mm) minimum object	SA1C-FK3 SA1C-FK3G	5.91" (150mm) 0.55" (14mm)	
SA9F-TH21 No sleeve **SA9F-TH22** 3.54" (90mm) sleeve	Heat-resistant glass fiber: Ø 0.04" (1mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.012" (0.3mm) minimum object	SA1C-FK3 SA1C-FK3G	3.94" (100mm) 0.31" (8mm)	
SA9F-TL53 (Not compatible with green LED)	Side view: one fiber 0.02" (0.5mm) Optical axis at 90° Detects: Ø 0.0024" (0.06mm) minimum object	SA1C-FK3 SA1C-FK3G	1.57" (40mm) —	

Refer to page Q-41 for the measuring conditions.

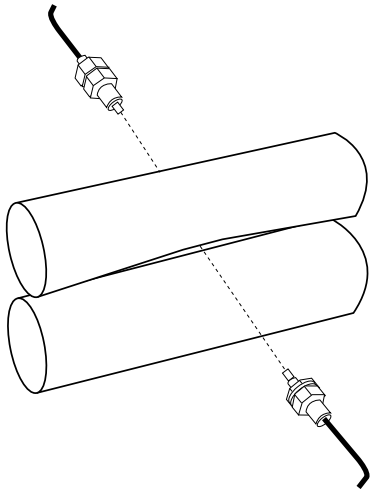
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Applications

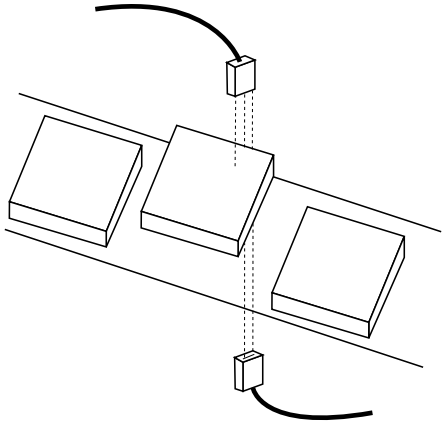
Monitoring the gradual change in liquid densities



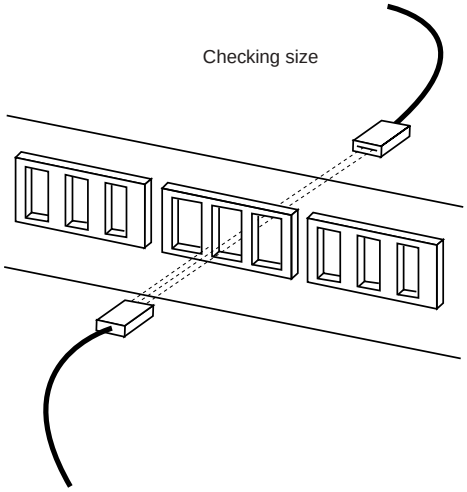
Detecting the roundness of rollers



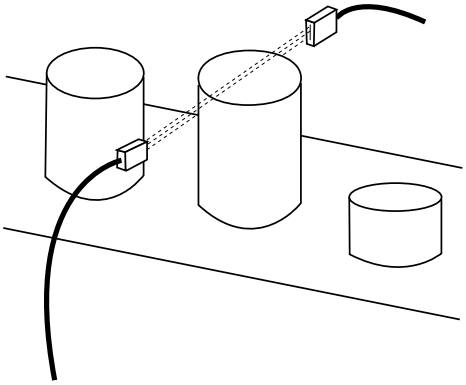
Sensing position or alignment



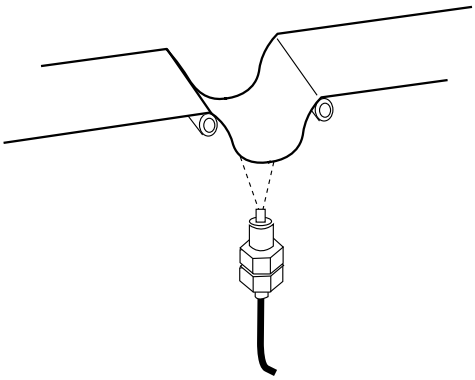
Checking size



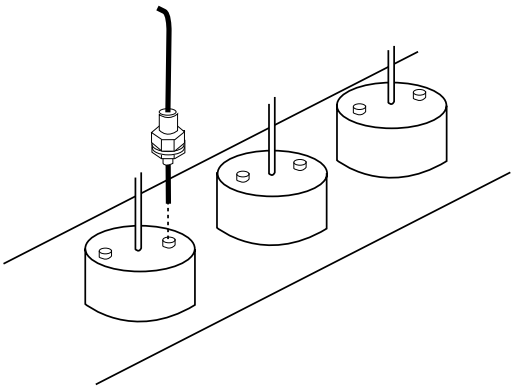
Checking height



Controlling web tension

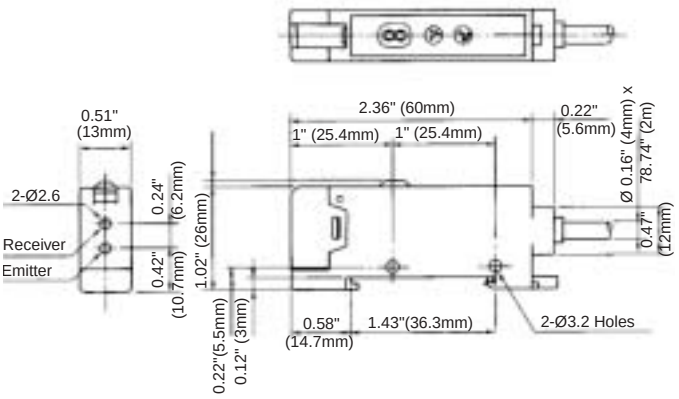


Sensing color marks

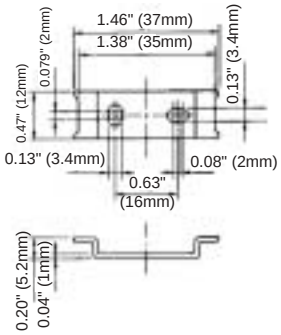


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

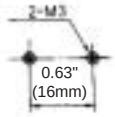
Dimensions



Mounting Bracket (attachment)
Not Required for DIN Rail Mounting



Mounting Hole Layout



(when using a mounting bracket)

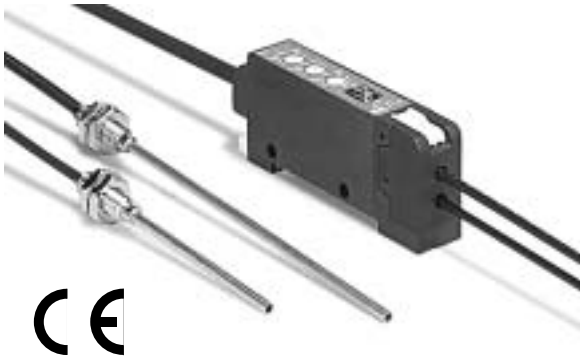
Q

Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1C-F: High-Speed, Miniature Photoelectric Sensors with Fiber Optics

- 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, 50µs response time
- Featuring variable off-delay (0 to 100 ms) and fine-tune sensitivity adjustment
- Stable LED makes alignment easy
- Red or green LEDs available for detecting color marks
- Mount on a 1.378" (35mm) DIN rail
- Protection rated IP66



General Specifications

Power Voltage	12V to 24V DC
Operating Voltage	10V to 30V DC, ripple 10% (maximum)
Current Draw	Standard speed: 30mA (maximum) High-speed: 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
Cable	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	Standard-speed: 0.5ms (maximum) High-speed: 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

	SA1C-FN, -FD (standard speed)	SA1C-F1N, -F1D (high-speed)
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 Common mode: 300V Pulse width: 50ns –1us, 100Hz (using a noise simulator)	Normal mode: 300V Common mode: 150V Pulse width: 50ns –1us, 100Hz (using a noise simulator)
Storage Temperature	–30 to +70°C (avoid freezing)	
Insulation Resistance	20M minimum with 500V DC megger (between live and dead parts)	
Dielectric Strength	1000V, 1 minute (between live and 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/S2 (approximately 49G), 10 shocks in each of 3 axes	
Weight	Cable type: Approximately 75g Quick-connect type: Approximately 30g	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA1C-F Fiber Optic Sensors

Amplifier Part Number	Output	Light Source	Response	Through-Beam Units Part Number	Range	Diffuse-Reflected Units Part Number	Range
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**: Ø 0.16" (M4) Straight **SA9F-TC**: Ø 0.16" (M4) Coiled **SA9F-TT**: Ø 0.12" (M3) Straight **SA9F-TM**: Ø 0.16" (M4) Multicore **SA9F-TH**: Heat-resistant glass fiber **SA9F-TL**: Side view	7.09" (180mm) 5.91" (150mm) 1.97" (50mm) 5.91" (150mm) 3.94" (100mm) 1.57" (40mm)	**SA9F-DS**: Ø 0.24" (M6) Straight **SA9F-DC**: Ø 0.24" (M6) Coiled **SA9F-DD**: Ø 0.24" (M6) Coaxial **SA9F-DT**: Ø 0.12" (M3) Straight **SA9F-DM**: Ø 0.01" (0.26mm) Multicore **SA9F-DH**: Heat-resistant glass fiber **SA9F-DL**: Side view	2.36" (60mm) 0.98" (25mm) 2.36" (60mm) 0.79" (20mm) 2.36" (60mm) 1.06" (27mm) 0.39" (10mm)
SA1C-FD3F (Cable) **SA1C-FD3FC** (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) PNP transistor: 200mA (maximum)						
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**: Ø 0.16" (M4) Straight **SA9F-TC**: Ø 0.16" (M4) Coiled **SA9F-TT**: Ø 0.12" (M3) Straight **SA9F-TM**: Ø 0.16" (M4) Multicore **SA9F-TH**: Heat-resistant glass fiber **SA9F-TL**: Incompatible with green LED	0.63" (16mm) 0.55" (14mm) 0.20" (5mm) 0.55" (14mm) 0.31" (8mm) N/A	**SA9F-DS**: Ø 0.24" (M6) Straight **SA9F-DC**: Incompatible with green LED **SA9F-DD**: Ø 0.24" (M6) Coaxial **SA9F-DT**: Incompatible with green LED **SA9F-DM**: Ø 0.01" (0.26mm) Multicore **SA9F-DH**: Incompatible with green LED **SA9F-DL**: Incompatible with green LED	0.28" (7mm) N/A 0.28" (7mm) N/A 0.16" (4mm) N/A N/A
SA1C-FD3FG (Cable) **SA1C-FD3FGC** (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) PNP transistor: 200mA (maximum)						
SA1C-F1N3E (Cable) **SA1C-F1N3EC** (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) Self-diagnostic: 50mA (maximum)	Red LED	High-speed: 50 µs	**SA9F-TS**: Ø 0.16" (M4) Straight **SA9F-TC**: Ø 0.16" (M4) Coiled **SA9F-TT**: Ø 0.12" (M3) Straight **SA9F-TM**: Ø 0.16" (M4) Multicore **SA9F-TH**: Heat-resistant glass fiber **SA9F-TL**: Side view	1.97" (50mm) 1.57" (40mm) 0.59" (15mm) 1.57" (40mm) 1.18" (30mm) 0.51" (13mm)	**SA9F-DS**: Ø 0.24" (M6) Straight **SA9F-DC**: Ø 0.24" (M6) Coiled **SA9F-DD**: Ø 0.24" (M6) Coaxial **SA9F-DT**: Ø 0.12" (M3) Straight **SA9F-DM**: Ø 0.01" (0.26mm) Multicore **SA9F-DH**: Heat-resistant glass fiber **SA9F-DL**: Side view	0.79" (20mm) 0.28" (7mm) 0.79" (20mm) 0.24" (6mm) 0.71" (18mm) 0.28" (7mm) 0.12" (3mm)
SA1C-F1D3F (Cable) **SA1C-F1D3FC** (Quick-Connect)	30V DC NPN transistor: 100mA (maximum) PNP transistor: 200mA (maximum)						

Ordering Details

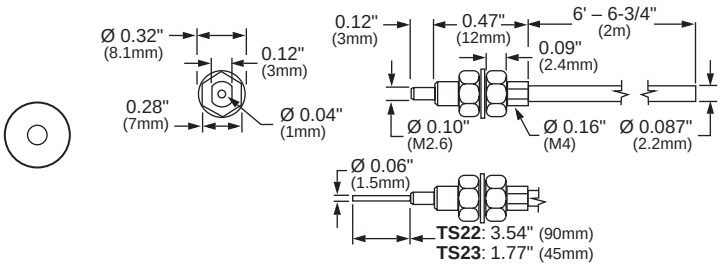
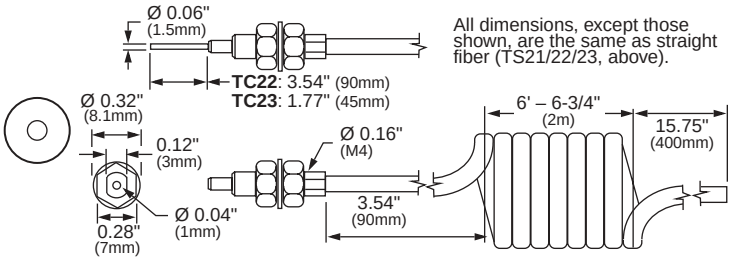
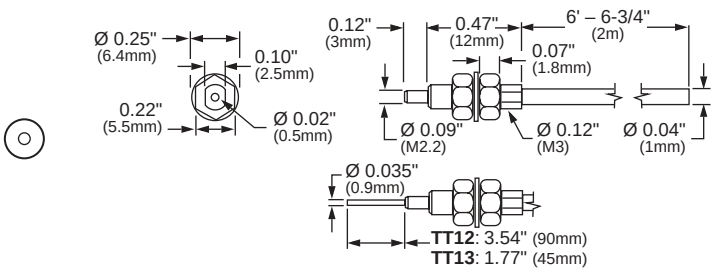
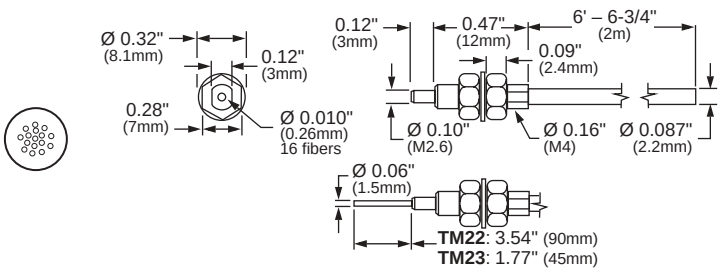
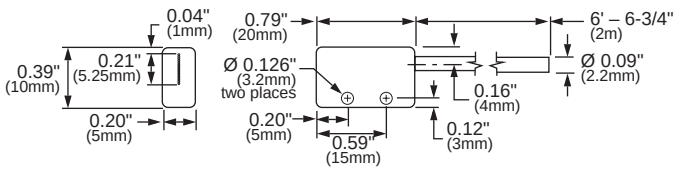
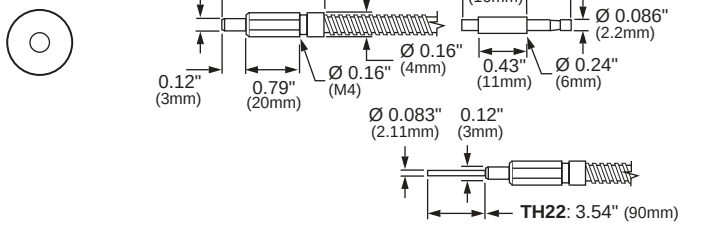
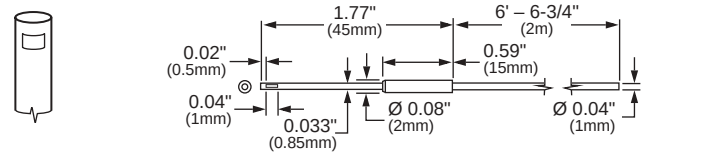
The SA1C-F series consists of the amplifier/receiver only. Fiber optic units must be ordered separately using part numbers beginning with SA9F. SA1C-F amplifier/receivers can be used with either the through-beam or diffuse-reflected fiber optic units.

Amplifier/receiver units include a mounting bracket, screws, and a screwdriver. Cables for quick-connect sensors are ordered separately. Optional attachments, available for modifying beam size of through-beam sensors, are also ordered separately (see pages Q-49 through Q-50).

The fiber optic cord is 6' – 6-3/4" (2m) long. The fiber optic cord can be cut to desired length using a fiber cutter, except for the heat-resistant glass fiber. A fiber cutter is included with fiber optic units (order SA9Z-F01 separately for replacement). A set of two easy-insert adaptors is included with the following fiber optic units: SA9F-TT, SA9F-TL, SA9F-DT, and SA9F-DL (order SA9Z-F02 for replacement set).

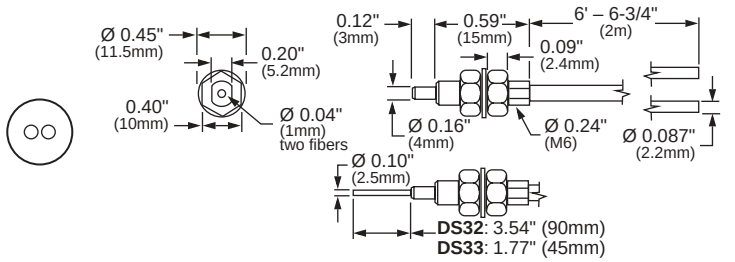
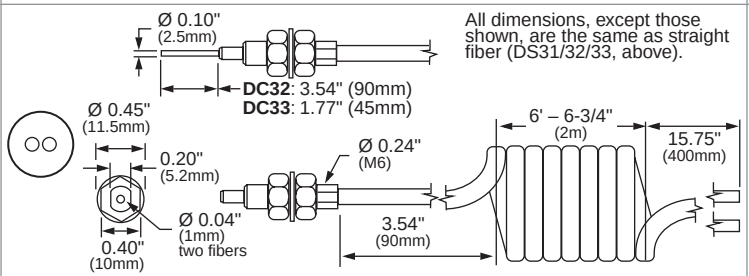
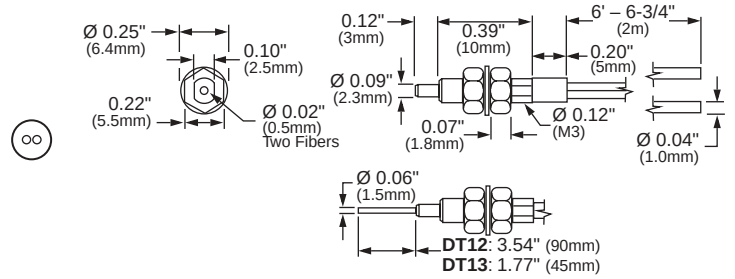
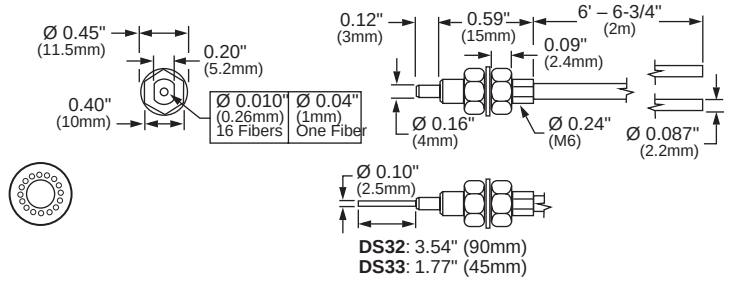
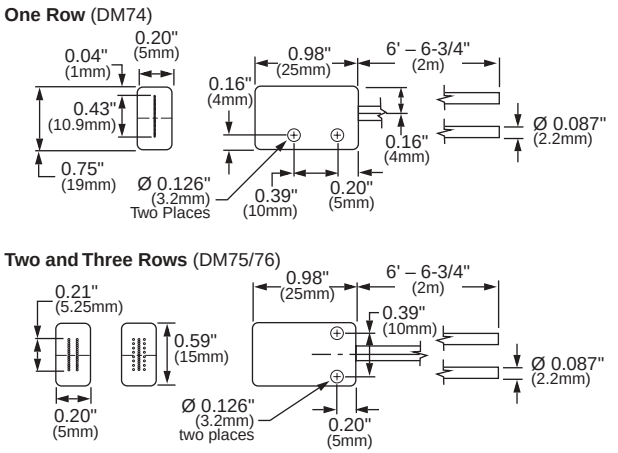
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA9F Through-Beam Fiber Optic Units

Part Number	Description	Dimensions	Appearance
SA9F-TS21 No sleeve **SA9F-TS22** 3.54" (90mm) sleeve **SA9F-TS23** 1.77" (45mm) sleeve	Straight fiber: Ø 0.04" (1mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.012" (0.3mm) minimum object		
SA9F-TC21 No sleeve **SA9F-TC22** 3.54" (90mm) sleeve **SA9F-TC23** 1.77" (45mm) sleeve	Coiled fiber: Ø 0.04" (1mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.012" (0.3mm) minimum object		
SA9F-TT11 No sleeve **SA9F-TT12** 3.54" (90mm) sleeve **SA9F-TT13** 1.77" (45mm) sleeve	Straight fiber: Ø 0.02" (0.5mm) Threaded mount: Ø 0.12" (M3) Detects: Ø 0.006" (0.15mm) minimum object		
SA9F-TM21 No sleeve **SA9F-TM22** 3.54" (90mm) sleeve **SA9F-TM23** 1.77" (45mm) sleeve	Multicore: 16 fibers (cluster) Ø 0.010" (0.26mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.012" (0.3mm) minimum object		
SA9F-TM74 16 fibers in one row	Multicore: 16 fibers (one row) Ø 0.010" (0.26mm) Detects: Ø 0.0024" (0.06mm) minimum object		
SA9F-TH21 No sleeve **SA9F-TH22** 3.54" (90mm) sleeve	Heat-resistant glass fiber: Ø 0.04" (1mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.012" (0.3mm) minimum object		
SA9F-TL53 (not compatible with green LED)	Side view: One fiber 0.02" (0.5mm) Optical axis at 90° Detects: Ø 0.0024" (0.06mm) minimum object		

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

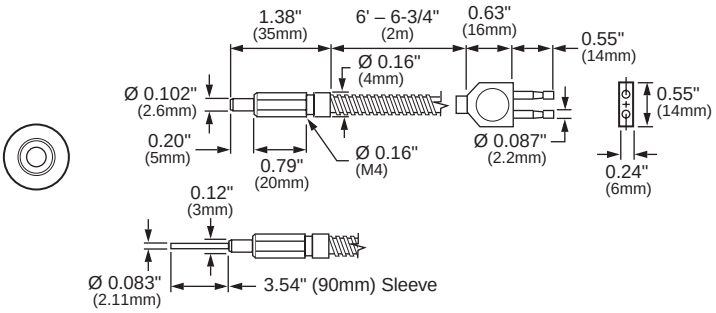
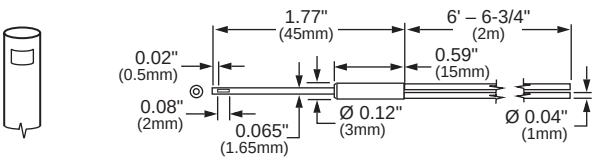
Part Numbers: SA9F Diffuse-Reflected Light Fiber Optic Units

Part Number	Description	Dimensions	Appearance
SA9F-DS31 No sleeve **SA9F-DS32** 3.54" (90mm) sleeve **SA9F-DS33** 1.77" (45mm) sleeve	Straight: Two fibers Ø 0.04" (1mm) Threaded mount: Ø 0.24" (M6) Detects: Ø 0.0012" (0.03mm) minimum object		
SA9F-DC31 No sleeve **SA9F-DC32** 3.54" (90mm) sleeve **SA9F-DC33** 1.77" (45mm) sleeve (all three not compatible with green LED)	Coiled: Two fibers Ø 0.04" (1mm) Threaded mount: Ø 0.24" (M6) Detects: Ø 0.0012" (0.03mm) minimum object		
SA9F-DT11 No sleeve **SA9F-DT12** 3.54" (90mm) sleeve **SA9F-DT13** 1.77" (45mm) sleeve (all three not compatible with green LED)	Straight: Two fibers Ø 0.02" (0.5mm) Threaded mount: Ø 0.12" (M3) Detects: Ø 0.0012" (0.03mm) minimum object		
SA9F-DD31	Coaxial: Core Ø 0.04" (1mm) + 16 fibers: Ø 0.01" (0.26mm) Threaded mount: Ø 0.24" (M6) Detects: Ø 0.0012" (0.03mm) minimum object		
SA9F-DM74 1 row = 32 fibers **SA9F-DM75** 2 rows = 16 each (Not compatible with green LED) **SA9F-DM76** 3 rows = 16 center + 8 fibers each side (not compatible with green LED)	Multicore: 32 fibers Ø 0.010" (0.26mm) Detects: Ø 0.0024" (0.06mm) minimum object		

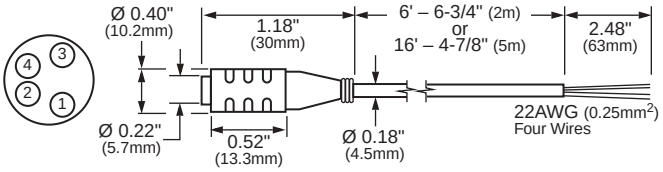
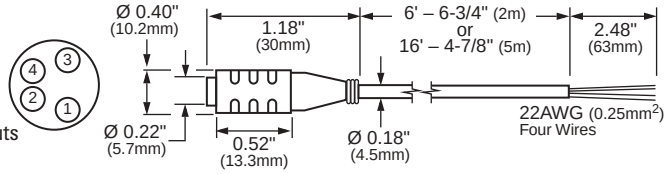
(continued on following page)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA9F Diffuse-Reflected Light Fiber Optic Units, continued

Part Number	Description	Dimensions	Appearance
SA9F-DH21 No sleeve **SA9F-DH22** 3.54" (90mm) sleeve (both not compatible with green LED)	Heat-resistant glass: Two fibers Ø 0.03" (0.7mm) Threaded mount: Ø 0.16" (M4) Detects: Ø 0.0012" (0.03mm) minimum object		
SA9F-DL63 (not compatible with green LED)	Side view: Two fibers Ø 0.02" (0.5mm) Optical axis at 90° Detects: Ø 0.0012" (0.03mm) minimum object		

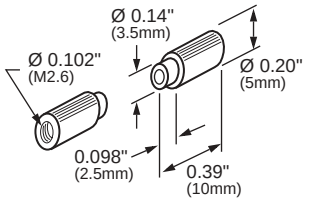
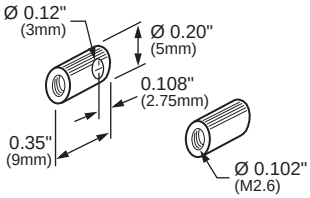
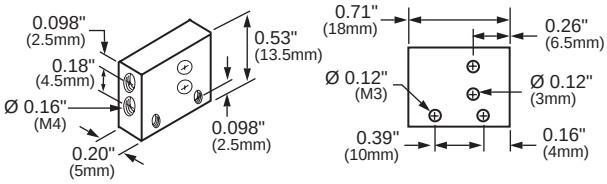
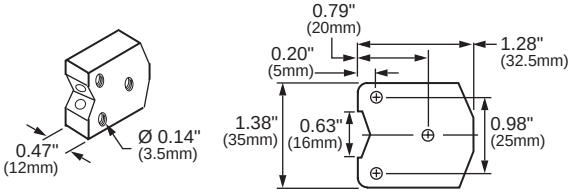
Part Numbers: Accessories

Part Number	Description	Used With	Dimensions
SA9C-CA4D2	4-core cable with connector 6'–6-3/4" (2m)	SA1C-F quick-connect only, NPN and PNP outputs	
SA9C-CA4D5	4-core cable with connector 16'–4-7/8" (5m)		
SA9C-CA4D2S	4-core cable with connector 6'–6-3/4" (2m)	SA1C-F quick-connect only, NPN and self-diagnostic outputs	
SA9C-CA4D5S	4-core cable with connector 16'–4-7/8" (5m)		
SA9Z-F01	Fiber cutter	All fiber units except heat resistant	HxLxD: 0.91" x 1.77" x 0.31" (23x 45 x 8Dmm) Included with fiber units; order replacement only
SA9Z-F02	Set of 2 easy-insert adaptors	SA9F-TT, SA9F-TL, SA9F-DT, and SA9F-DL	Ø 0.087" (OD) x 0.945" long (Ø 2.2mm x 24mm) Included with applicable fiber optic units; order replacement set only

(continued on following page)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: Accessories, continued

Part Number	Description	Used With	Dimensions
SA9Z-F11	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: 4' – 3-3/16" (1.3m) 5.31" (0.135m) SA9F-TC21: 3' – 3-3/8" (1m) 3.94" (0.1m) SA9F-TM21: 3' – 5-3/8" (1.05m) 5.12" (0.13m) Sensing ranges: Standard speed green LED: SA9F-TS21: 5.31" (0.135m) SA9F-TC21: 3.94" (0.1m) SA9F-TM21: 5.12" (0.13m) Sensing ranges:High-speed red LED: SA9F-TS21: 5.75" (0.4m) SA9F-TC21: 1.81" (0.3m) SA9F-TM21: 4.96" (0.38m)	
SA9Z-F12	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: 7.87" (200mm) SA9F-TC21: 5.12" (130mm) SA9F-TM21: 6.30" (160mm) Sensing ranges: High-speed red LED: SA9F-TS21: 1.97" (50mm) SA9F-TC21: 1.38" (35mm) SA9F-TM21: 1.57" (40mm)	
SA9Z-F13	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: 1.38" (35mm) SA9F-TC21: 1.81" (30mm) SA9F-TM21: 1.38" (35mm)	
SA9Z-F14	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: SA9F-TS21: ┐ SA9F-TC21: ├ 0.394" ± 0.039" (10mm ± 1mm) SA9F-TM21: ┘	

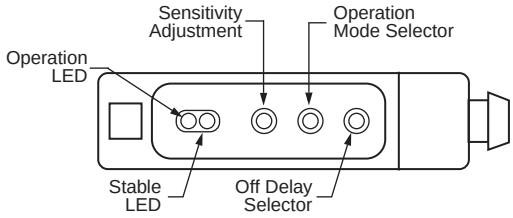
Detecting Color Marks

Color of Mark ❑ = Use Red LED ☆ = Use Green LED ◆ = Use Red or Green LED — = Not Detectable	Background Color: White	Yellow	Chartreuse	Orange	Red	Magenta	Turquoise	Blue	Violet	Green	Black
White	—	☆	◆	☆	☆	◆	◆	◆	◆	◆	◆
Yellow	☆	—	◆	☆	☆	☆	◆	◆	◆	◆	◆
Chartreuse	◆	◆	—	❑	❑	☆	❑	◆	☆	◆	◆
Orange	☆	☆	❑	—	—	☆	❑	◆	◆	◆	◆
Red	☆	☆	❑	—	—	❑	❑	◆	◆	◆	◆
Magenta	◆	☆	☆	☆	❑	—	❑	❑	—	❑	◆
Turquoise	◆	◆	❑	❑	❑	❑	—	❑	◆	☆	◆
Blue	◆	◆	◆	◆	◆	❑	❑	—	❑	❑	❑
Violet	◆	◆	☆	◆	◆	—	◆	❑	—	❑	❑
Green	◆	◆	◆	◆	◆	❑	☆	❑	❑	—	❑
Black	◆	◆	◆	◆	◆	◆	◆	❑	❑	❑	—

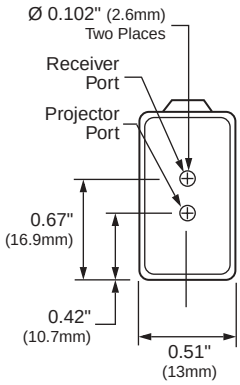
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions

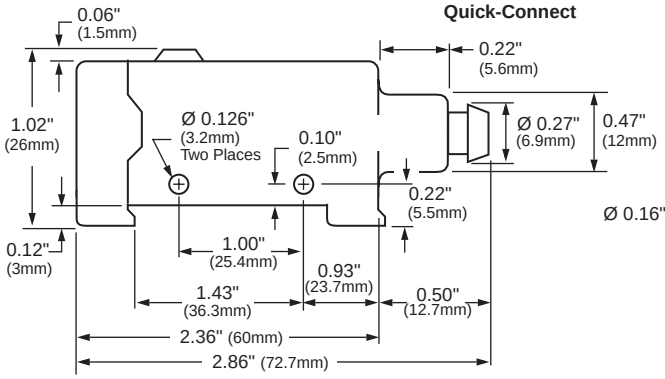
SA1C-F Series Amplifier Unit



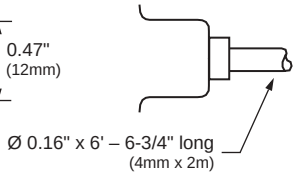




Quick-Connect



Cable Style



For dimensions on fiber optic units, see page Q-47 (through-beam) or pages Q-48 through Q-49 (diffuse-reflected light).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1C: Self-Contained Miniature Photoelectric Sensors

Key features of the SA1C include:

- Featuring quick connect cable for easy installation
- Miniature photoelectric sensors with built-in amplifier/receiver
- Retro-reflected, polarized retro-reflected, limited reflected, and spot-reflected light sensing available
- Sensing range up to 32'–9-3/4" (10m) for through-beam sensors
- Dual outputs: Select NPN and PNP transistor outputs or NPN transistor output combined with self-diagnostic output
- Outputs selectable for light on or dark on
- High-speed, 0.5 ms response time
- Mount two adjacent units without interference
- Protection rated IP67 (quick-connect: IP66)



General Specifications

Power Voltage	12V to 24V DC
Operating Voltage	10V to 30V DC, ripple 10% (maximum)
Current Draw	Through-beam receiver: 20mA (maximum) Through-beam projector and polarized retro-reflected: 25mA (maximum) All other reflected light sensors: 30mA (maximum)
Operating Temperature	–25° to +55°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 (maximum) on receiver surface — defined as incident or unwanted light received by a sensor, unrelated to the presence or absence of intended object
Material	PBT resin (housing) with polycarbonate lens
Degree of Protection	Cable type: IP67; Quick-connect type: IP66 — IEC Pub 529, sensors rated IP66 are dust-tight, water-resistant, and perform best when not subjected to heavy particle or water blasts; sensors rated IP67 are dust-tight, water-tight, and are tolerant of being submerged and splashed with water for short periods of time
Cable	Cable type: 0.2mm^2; Vinyl cabtyre cable #24 AWG, 6'–6-3/4" (2m) long Quick-connect Type: 0.31" diameter (8mm) 3- or 4-pin connector (cable ordered separately for quick connect sensors)
Light Source	Polarized retro-reflected and spot-reflected light: Red LED Through-beam, retro-reflected, diffuse-reflected, and limited-reflected light: Infrared LED
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	0.5 ms (maximum)
Operation Mode	Light on or dark on (selectable by switch on amplifier)
Indicator	Operation indicator: Red LED (out) Stable level indicator: Green LED (stable)
Sensitivity Adjustment	One-turn adjustment
Noise Resistance	Normal mode: 500V Common mode: 300V Pulse width: 50ns –1us, 100Hz (using a noise simulator)
Storage Temperature	–30 to +70˚C (avoid freezing)
Dielectric Strength	1,000V, 1 minute: Between live and 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/S2 (approximately 49G), 10 shocks in each of 3 axes
Weight	Cable type: Approximately 70g Quick-connect type: Approximately 25g

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

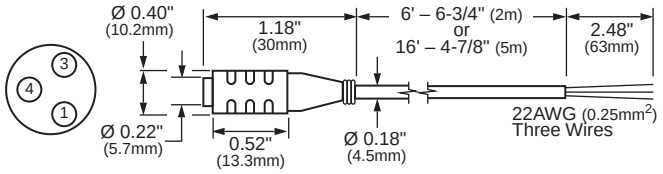
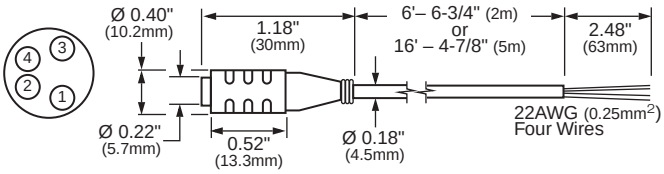
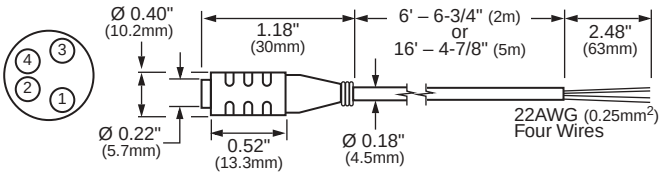
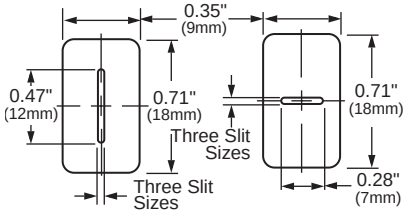
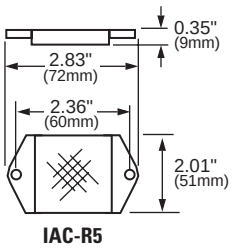
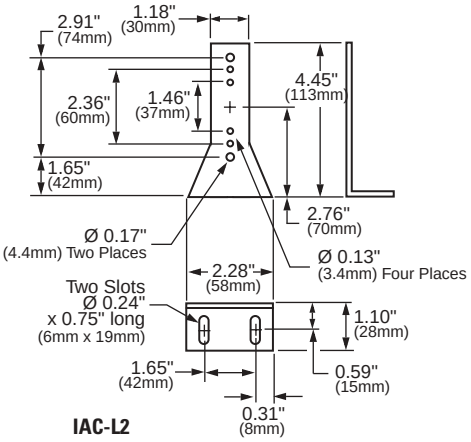
Part Numbers: Complete Self-Contained Unit

Part Number	Connection	Type	Output	Sensing Range	Detects
SA1C-TN3S	Cable	Through-Beam	NPN transistor and self-diagnostic outputs 30V DC, NPN: 100mA, S/D out: 50mA (maximum)	32' – 9-3/4" (10m)	Opaque Objects Ø 0.20" (5mm) Minimum
SA1C-TN3SC	Quick Connect				
SA1C-TD3	Cable		NPN transistor and PNP transistor outputs 30V DC, NPN: 100mA, PNP: 200mA (maximum)		
SA1C-TD3C	Quick Connect				
SA1C-RN3S	Cable	Retro-Reflected Light	NPN transistor and self-diagnostic outputs 30V DC, NPN: 100mA, S/D out: 50mA (maximum)	16' – 4-7/8" (5m)	
SA1C-RN3SC	Quick Connect				
SA1C-RD3	Cable		NPN transistor and PNP transistor outputs 30V DC, NPN: 100mA, PNP: 200mA (maximum)		
SA1C-RD3C	Quick Connect				
SA1C-PN3S	Cable	Polarized Retro-Reflected	NPN transistor and self-diagnostic outputs 30V DC, NPN: 100mA, S/D out: 50mA (maximum)	9' – 10-1/8" (3m)	
SA1C-PN3SC	Quick Connect				
SA1C-PD3	Cable		NPN transistor and PNP transistor outputs 30V DC, NPN: 100mA, PNP: 200mA (maximum)		
SA1C-PD3C	Quick Connect				
SA1C-DN3S	Cable	Diffuse-Reflected Light	NPN transistor and self-diagnostic outputs 30V DC, NPN: 100mA, S/D out: 50mA (maximum)	23.62" (600mm)	Opaque or Transparent Objects
SA1C-DN3SC	Quick Connect				
SA1C-DD3	Cable		NPN transistor and PNP transistor outputs 30V DC, NPN: 100mA, PNP: 200mA (maximum)		
SA1C-DD3C	Quick Connect				
SA1C-GN3S	Cable	Limited-Reflected Light	NPN transistor and self-diagnostic outputs 30V DC, NPN: 100mA, S/D out: 50mA (maximum)	3.14" (80mm)	
SA1C-GN3SC	Quick Connect				
SA1C-GD3	Cable		NPN transistor and PNP transistor outputs 30V DC, NPN: 100mA, PNP: 200mA (maximum)		
SA1C-GD3C	Quick Connect				
SA1C-NN3S	Cable	Spot-Reflected Light	NPN transistor and self-diagnostic outputs 30V DC, NPN: 100mA, S/D out: 50mA (maximum)	3.94" (100mm)	
SA1C-NN3SC	Quick Connect				
SA1C-ND3	Cable		NPN transistor and PNP transistor outputs 30V DC, NPN: 100mA, PNP: 200mA (maximum)		
SA1C-ND3C	Quick Connect				

The SA1C series features a receiver with a built-in amplifier. One part number = complete sensor. Mounting bracket, screws, and screwdriver are included. Retro-reflected light sensors (polarized or not polarized) include a reflective backplate. Cable for quick-connect sensors must be ordered separately. Optional attachments are available for modifying through-beam sensors and also must be ordered separately (see the following page).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: Accessories

Part Number	Description	Used With	Dimensions
SA9C-CA3D2	3-core cable with connector, 6'–6-3/4" (2m)	SA1C through-beam with quick-connect only	
SA9C-CA3D5	3-core cable with connector, 16'–4-7/8" (5m)		
SA9C-CA4D2	4-core cable with connector, 6'–6-3/4" (2m)	SA1C quick-connect only, NPN and PNP outputs	
SA9C-CA4D5	4-core cable with connector, 16'–4-7/8" (5m)		
SA9C-CA4D2S	4-core cable with connector, 6'–6-3/4" (2m)	SA1C quick-connect only, NPN and self-diagnostic outputs	
SA9C-CA4D5S	4-core cable with connector, 16'–4-7/8" (5m)		
SA9Z-S04	Option with vertical slit (modifies beam size to eliminate interference when sensors are mounted in close proximity)	SA1C through-beam only, includes three slit sizes — **Sensing ranges:** Slit: 0.020" (0.5mm) Slit: 0.039" (1mm) Slit: 0.079" (2mm) **Used on one side:** 6' – 6-3/4" (2m) 7' – 10-1/2" (2.4m) 13' – 1-1/2" (4m) **Sensing ranges:** Slit: 0.020" (0.5mm) Slit: 0.039" (1mm) Slit: 0.079" (2mm) **Used on two sides:** 11.81" (0.3m) 35.43" (0.9m) 5' – 3" (1.6m)	
SA9Z-S05	Option with horizontal slit (modifies beam size to eliminate interference when sensors are mounted in close proximity)		
IAC-R5	Reflective backplate (replacement)	SA1C retro-reflected (with polarizer or without polarizer)	 IAC-R5
IAC-L2	Mounting bracket for reflective backplate (IAC-R5)		 IAC-L2
SA9Z-F03	Control knob (used to change sensitivity or operation mode)	Any SA1C sensor	

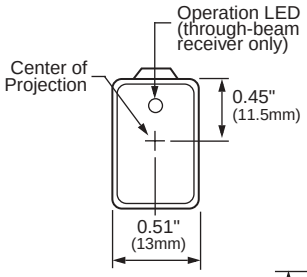
Q

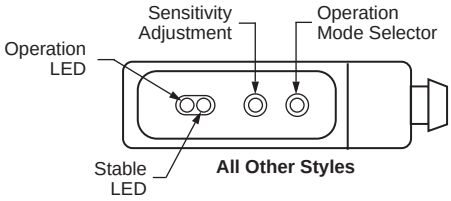
Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

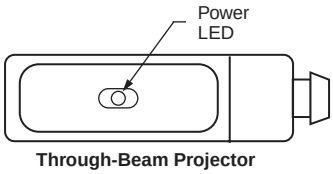
Dimensions

SA1C Series
Self-Contained
Amplifier/Receiver



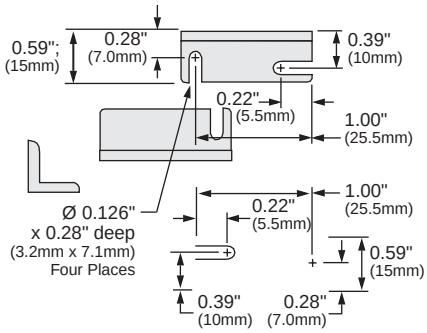


All Other Styles

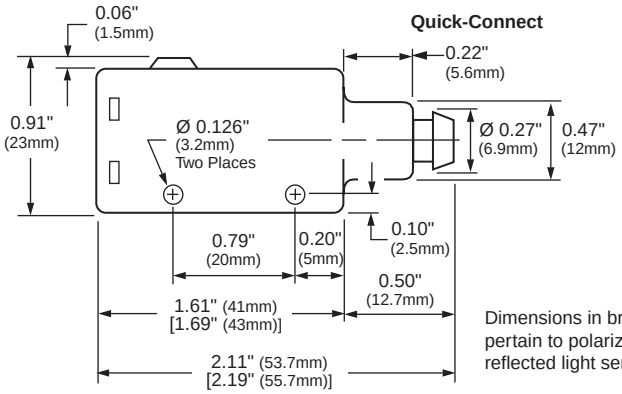


Through-Beam Projector

Mounting Bracket
(included with each sensor)

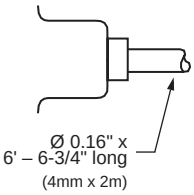


Quick-Connect



Dimensions in brackets pertain to polarized retro-reflected light sensors.

Cable Style



Q Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SA1A and SA1B: High-Speed, Slim Style Photoelectric Sensors

Key features of the SA1A and SA1B include:

- Ideal for installations with broad or narrow clearances
- Available with through-beam between the projector and receiver, which features a sensing range of 6'–6-3/4" (2m)
- Sensing by diffuse-reflected light available, with a sensitivity adjustment for eliminating the interference of background light
- Through-beam and diffuse-reflected light sensors are featured in all configurations
- Configurations include NPN or PNP transistor output, with light on or dark on (senses the presence or absence of an object)
- Adverse results and circuit damage are avoided through protection from reverse polarity
- High-speed, 1ms response time
- Automatic reset with power-up
- Protection rated IP66



CE

General Specifications

Power Voltage	12V to 24V DC
Operating Voltage	10V to 30V DC, (ripple 10% maximum)
Current Draw	25mA (maximum)
Dielectric Strength	Between live and dead parts: 1,000V AC, 50/60Hz, 1 minute
Insulation Resistance	Between live and dead parts: 20MΩ (minimum), with 500V DC megger
Operating Humidity	35 to 85% RH (avoid condensation)
Operating Temperature	–15° to +55°C (avoid freezing)
Storage Temperature	–25° to +65°C
Vibration Resistance	Damage limits: 10 to 55Hz, amplitude 1.5mm p-p, 2 hours in each of 3 axes
Shock Resistance	Damage limits: 500m/s^2 (approximately 50G), 10 shocks in each of 3 axes
Extraneous Light Immunity	Sunlight: 10,000 lux (maximum), Incandescent light: 3,000 lux (maximum) — defined as incident or unwanted light received by a sensor, unrelated to the presence or absence of the intended object
Material	Housing and lens: polycarbonate
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
Cable	Cable type: 0.2mm^2; Vinyl cabtyre cable #26 AWG x 6'–6-3/4" (2m) long Transmitter: 2-core, Receiver: 4-core
Cable Extension	328' (100m) maximum using #22 AWG (0.3mm^2) cabtyre cable or better
Weight	Projector: 40g; Receiver: 45g

Function Specifications

Narrow/Flat Type	SA1A/B-TN1, -TN2	SA1A/B-DN1, -DN2	SA1A/B-TP1, -TP2	SA1A/B-DP1, -DP2
Detection	Through-beam	Diffuse-reflected light	Through-beam	Diffuse-reflected light
Sensitivity	——	Adjustable	——	Adjustable
Hysteresis	——	20% (maximum)	——	20% (maximum)
Output	NPN transistor open collector 30V DC, 100mA (maximum)		PNP transistor open collector 30V DC, 100mA (maximum)	
Light Source	Infrared LED (modulation mode)			
LED	On: When output is on			
Response	1ms (maximum)			

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: SA1A and SA1B Sensors

Part Number	Type	Output	On	Sensing Range	Detects	Style
SA1A-TN1	Through-Beam	NPN	Light On: No Object Detected	6' – 6-3/4" (2m)	Opaque Objects Ø 0.20" (5mm) Minimum	 Broad Style
SA1A-TN2			Dark On: Object Detected			
SA1A-TP1		PNP	Light On: No Object Detected			
SA1A-TP2			Dark On: Object Detected			
SA1A-DN1	Reflected Light	NPN	Light On: Object Detected	1.97" (50mm)	Opaque or Transparent Objects	
SA1A-DN2			Dark On: No Object Detected			
SA1A-DP1		PNP	Light On: Object Detected			
SA1A-DP2			Dark On: No Object Detected			
SA1B-TN1	Through-Beam	NPN	Light On: No Object Detected	6' – 6-3/4" (2m)	Opaque Objects Ø 0.20" (5mm) Minimum	 Narrow Style
SA1B-TN2			Dark On: Object Detected			
SA1B-TP1		PNP	Light On: No Object Detected			
SA1B-TP2			Dark On: Object Detected			
SA1B-DN1	Reflected Light	NPN	Light On: Object Detected	1.97" (50mm)	Opaque or Transparent Objects	
SA1B-DN2			Dark On: No Object Detected			
SA1B-DP1		PNP	Light On: Object Detected			
SA1B-DP2			Dark On: No Object Detected			

All sensors include mounting brackets/screws. Through-beam sensors come with a crimping tool, and diffuse-reflected sensors include a screwdriver.

Modifying Beam Width: Through-Beam

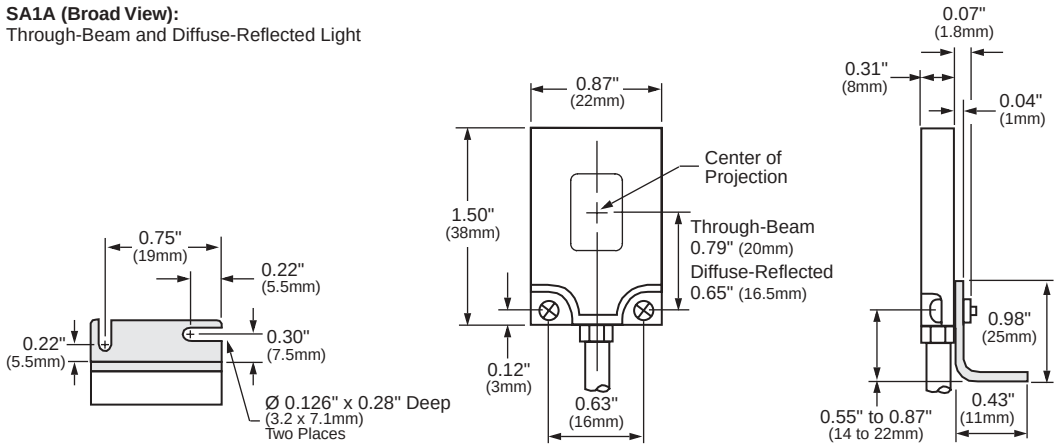
Slit options, ordered separately, modify the beam size of through-beam sensors. Use when interference results from mounting sensors in close proximity.

Part Number and Slit Width	Used on One Side	Used on Both Sides
SA9Z-S01 0.02" (0.5mm)	19.69" (0.5m)	11.81" (0.3m)
SA9Z-S02 0.04" (1mm)	39.37" (1m)	23.62" (0.6m)
SA9Z-S03 0.08" (2mm)	59.06" (1.5m)	35.43" (0.9m)

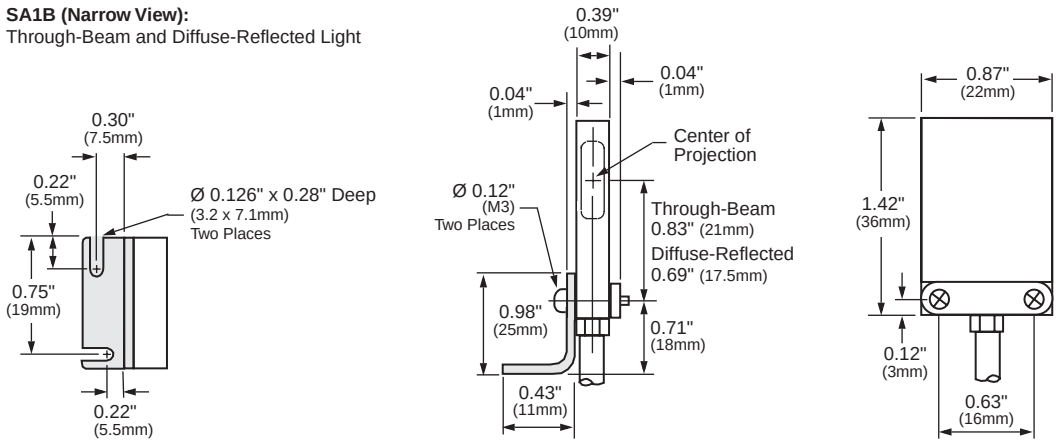
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions

SA1A (Broad View):
Through-Beam and Diffuse-Reflected Light

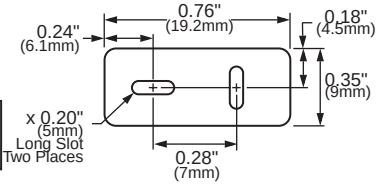


SA1B (Narrow View):
Through-Beam and Diffuse-Reflected Light



Option with Slit:
Modify Beam Size of
Through-Beam Sensor

Part No. SA9Z-
S01: Ø 0.02" (0.5mm)
S02: Ø 0.04" (1.0mm)
S03: Ø 0.08" (2mm)



2. For through-beam sensors, dimensions for the projector and receiver are the same. On all sensors, the cord is Ø 0.16" x 6' – 6-3/4" long (Ø 4mm x 2m).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ISF: Heavy Duty Photoelectric Sensors

Key features of the ISF include:

- Rugged, waterproof photoelectric sensors with universal voltages
- 24–240V AC/24–240V DC or 10–30V DC; both available with time delay
- Featuring through-beam sensing between the projector and receiver, with sensing range of 32' – 9-3/4" (10m)
- Diffuse-reflected light sensing, as well as retro-reflected — with or without polarization
- All sensors are available with three time delay modes (one-shot, on-delay, or off-delay) selectable from 0.1 to 5 seconds
- DC sensors have dual NPN/PNP transistor outputs
- Universal-voltage sensors have one NO relay contact
- Diffuse-reflected light sensors feature a sensitivity adjustment control
- All units are selectable: light on or dark on
- Unique touch-down terminals reduce wiring time
- Protection rated IP66



UL Recognized
File No. E55996

CSA Certified
File No. LR21451

General Specifications

Power Voltage	Universal voltage type: 24V to 240V AC (24V to 240V DC compatible) DC type: 10V to 30V DC (ripple 10% maximum)
Operating Voltage	Universal voltage: 21.6V to 264V AC, 50/60Hz (21.6V to 264V DC compatible)
Dielectric Strength	Between power and output terminals: 1,500V AC, 1 minute (universal-voltage type) Between output terminals: 1,000V AC, 1 minute (universal-voltage type) Between live and dead parts: 1,000V AC, 1 minute (DC type)
Insulation Resistance	Between power and output terminals: 20 MΩ (minimum) with 500V DC megger (universal-voltage) Between live and dead parts: 20 MΩ (minimum) with 500V DC megger (DC type)
Operating Temperature	–10° to +60°C (avoid freezing)
Operating Humidity	35 to 85% RH (avoid condensation)
Storage Temperature	–20° to +70°C
Vibration Resistance	Damage limits: 10 to 55Hz, amplitude 1.5mm p-p, 2 hours in each of 3 axes
Shock Resistance	Damage limits: 500m/s^2 (approximately 50G), 3 shocks in each of 3 axes
Extraneous Light Immunity	Sunlight: 10,000 lux at receiver, Incandescent light: 3,000 lux at receiver — defined as incident or unwanted light received by a sensor, unrelated to the presence or absence of the intended object
Material	Housing: PBT; Lens: acrylic resin; Cover: polycarbonate
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 (JIS C 0920 watertight)
Applicable Cable (not included)	Cable: Ø 0.31" to 0.39" (8 to 10mm), Core: #18 to #24 AWG (0.25 to 0.75mm^2); Extension: 328' (100m) maximum using #22 AWG (0.3mm^2) cabtyre cable or better (not included or offered by IDEC – must be purchased separately)
Weight	Through-beam: 75g (projector), 100g (universal voltage receiver), 90g (DC receiver) Reflected light: 100g (universal voltage), 90g (DC)
Dimensions (HxWxD)	2.66" x 1.02" x 3.62" (67.5 x 26 x 92mm)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Part Numbers: Universal Voltage Types

Part Number	Time Delay	Detects by	Sensing Range	Detects	Power Voltage
ISF-T10MU	No	Through-Beam	32' – 9-3/4" (10m)	Opaque Objects Ø 0.63" (16mm) Minimum	24 to 240V AC (50/60Hz), 24 to 240V DC Compatible
ISF-T10MTU	Yes				
ISF-R05MU	No	Retro-Reflected Light	16' – 4-7/8" (5m)	Opaque Objects Ø 2.36" (60mm) Minimum	
ISF-R05MTU	Yes				
ISF-P03MU	No	Polarized Retro-Reflected Light	9' – 10-1/8" (3m)	Opaque or Mirror-Like Objects Ø 2.36" (60mm) Minimum	
ISF-P03MTU	Yes				
ISF-D500U	No	Diffuse-Reflected Light with Sensitivity Adjustment	19.69" (0.5m)	Opaque or Transparent Objects	
ISF-D500TU	Yes				

Part Numbers: DC Types

Part Number	Time Delay	Detects by	Sensing Range	Detects	Power Voltage
ISF-T10MW	No	Through-Beam	32' – 9-3/4" (10m)	Opaque Objects Ø 0.63" (16mm) Minimum	10 to 30V DC with 10% ripple (maximum)
ISF-T10MWT	Yes				
ISF-R05MW	No	Retro-Reflected Light	16' – 4-7/8" (5m)	Opaque Objects Ø 2.36" (60mm) Minimum	
ISF-R05MWT	Yes				
ISF-P03MW	No	Polarized Retro-Reflected Light	9' – 10-1/8" (3m)	Opaque or Mirror-Like Objects Ø 2.36" (60mm) Minimum	
ISF-P03MWT	Yes				
ISF-D500W	No	Diffuse-Reflected Light with Sensitivity Adjustment	19.69" (0.5m)	Opaque or Transparent Objects	
ISF-D500WT	Yes				

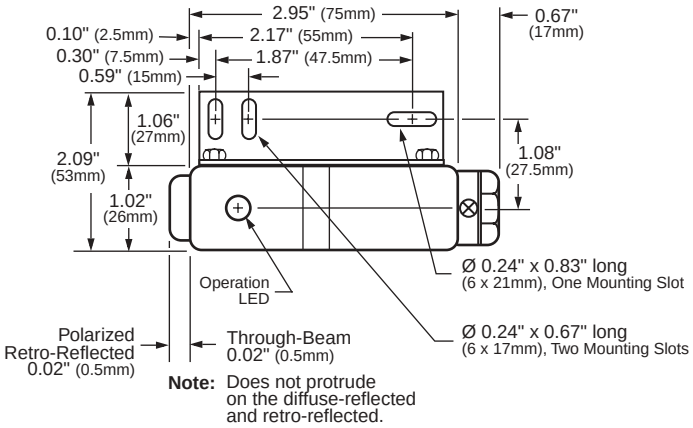
1. All sensors come with mounting brackets. Retro-reflected light sensors (with or without polarization) come with a rectangular reflective backplate. Diffuse-reflected light sensors and sensors with time delay include a screwdriver for the adjustment dial.

Function Specifications	
Output	Universal voltage: One NO contact, electromechanical relay, 250V AC/1A, 30V DC/2A (resistive load) DC: NPN/PNP transistor open collector, 100mA (maximum) with short circuit protection Maximum residual voltage: 1.0V (NPN), 2.4V (PNP)
Light Source	Diffuse and retro-reflected sensors: Infrared LED Polarized retro-reflected sensors: Red LED
Indicator	On: Turns on when output is on (red LED)
Response	Universal voltage: 20ms (maximum); DC: 3ms (maximum)
Hysteresis	Universal voltage and DC diffuse-reflected sensors: 15% at 19.69" (0.5m)
Power Consumption	Universal voltage: 3VA (maximum); Through-beam: 3VA *each* for the projector and the receiver DC: 30 mA (maximum); Through-beam: 15 mA (projector), 20 mA (receiver)
Time Delay	0.1 to 5.0 seconds (adjustable)
Time Delay Modes	Selectable: One-shot, on-delay, or off-delay, using DIP switches
Temperature Error	±10% (maximum) over –10 to +60°C (reference temperature: +20°C)
Repeat Error	±1.0% (maximum) for repeat inputs at intervals of 10 seconds or more

2. Delay time is decreased by 5% when another object is detected during timedown.

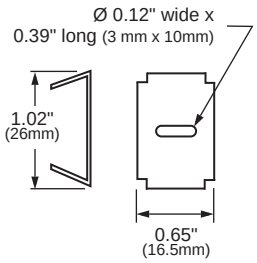
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions

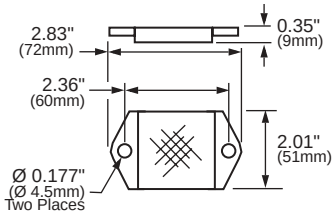


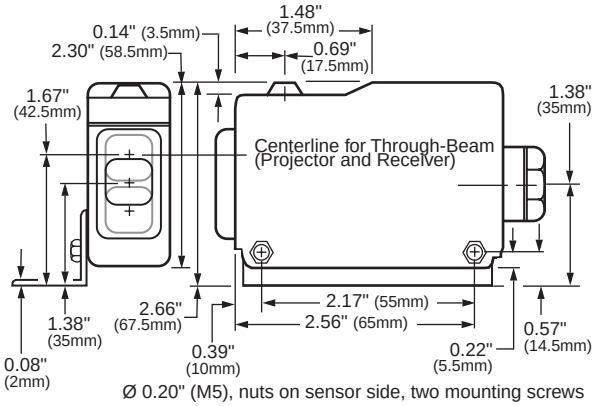
Note: Does not protrude on the diffuse-reflected and retro-reflected.

Slit for Through-Beam
(option) Part Number IAC-S1



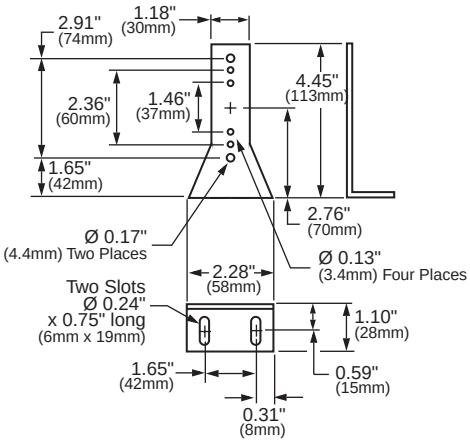
Square Reflective Backplate
(replacement) Part Number IAC–R5





Ø 0.20" (M5), nuts on sensor side, two mounting screws

Reflector Bracket
(option) Part Number IAC-L2



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DPRI: Magnetic Proximity Switches

The DPRI magnetic proximity switch incorporates a sealed reed switch and four magnets inside a compact housing. This self-contained proximity switch requires no external power supply and can detect the presence of magnetic objects without contact.





Key features of the DPRI include:

- Lightweight, compact design reduces mounting space requirements
- Compact size allows units to be mounted in close proximity to each other
- Sealed reed contact can be used in dusty locations
- Long life and high reliability

General Specifications

Normal Switching Distance	5mm ±10%
Operating Distance	0 to 4mm
Release Distance	Over switching distance, 9mm (maximum)
Repeat Error ON	0.05mm (maximum)
Repeat Error OFF	0.15mm (maximum)
Temperature Error (–10 to 50˚C)	±0.5mm or less (20˚C as standard)
Response Speed	300Hz or less (bounce 0.4ms or less)
Output	
Contact Configuration	1NO
Switching Capacity	AC: 10VA (maximum) DC: 10W (maximum)
Operating Voltage	AC: 100V (maximum) DC: 100V (maximum)
Operating Current	AC: 0.25A (maximum) DC: 0.25A (maximum)
Initial Contact Resistance	0.35Ω (maximum)
Shock Resistance	20G or less
Ambient Temperature Range	–10 to +50˚C
Sensing Object	Magnetic materials: Fe, Ni, Cu, Ferrite, etc.
Standard Sensing Object	30 x 20 x 1mm, Ferromagnetic soft iron plate
Life Expectancy	
Electrical	Contact resistance 1.5Ω or less after 20,000,000 operations
Mechanical	1,000,000,000 operations
Lead Wire	Cable type: 5mm 2-core vinyl cabtyre cable, 3-1/3' (1m) long
Weight	Approximately 40g

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

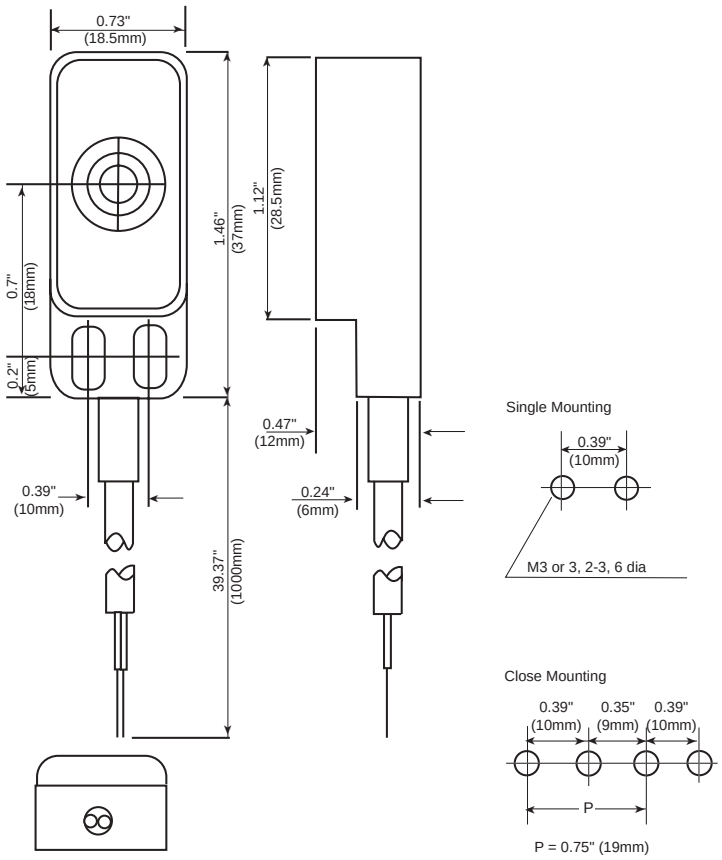
Part Number: DPRI Switches

Part Number	Description
DPRI-01	Magnetic Proximity Switch

Operation Principle

The DPRI incorporates four magnets and a sealed reed switch. The contacts of the reed switch are held normally open by the magnetic field of the four magnets. When a metallic object is within the sensing range, the magnetic field is neutralized, closing the contacts of the reed switch. When the object is removed beyond the sensing distance, the magnetic field is restored and the contacts of the reed switch open.

Dimensions



Q Sensors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

General Information

Specifications

Do not operate a sensor under any conditions exceeding these specifications.

Do not operate a sensor under current and voltage conditions other than those for which the individual sensor is rated.

Do not exceed the recommended operating temperature and humidity. Although sensors are rated for operation below 0°C, this specification does not imply that performance characteristics will remain constant under prolonged freezing conditions. Continued exposure and the accompanying frost, ice, dew, and condensation which accumulate on the optical surface will adversely affect sensor performance.

To maintain superior performance characteristics, do not exceed vibration and shock resistance ratings while operating a sensor. In addition, avoid isolated impacts to the sensor housing which are severe enough to adversely affect the waterproof characteristics.

IEC (International Electrotechnical Commission) Ratings

Sensors rated IP67 are resistant to moisture when occasionally immersed in still water. Sensors rated IP64 through IP66 are resistant to moisture when occasionally subjected to splashing or when located in the vicinity of turbulent waters. These ratings do not imply that a sensor is intended for use under continual high-pressure water spray. Avoid such applications to maintain optimal sensor performance.

Sensors rated IP64 through IP67 are dust-tight and water-tight. For best performance, avoid using any sensor in an area where it will be subjected to heavy particle blasts and where dust, water, or steam will accumulate on the optical surface.

Start-up

Do not test the housing for dielectric strength and insulation resistance, since the housing is connected to the electronic circuit ground of a sensor. Do not perform dielectric strength and insulation resistance tests on electrical systems without disconnecting photoelectric sensors, as such testing may result in damage to the sensor.

Several lines of sensors, as noted in the individual *operation* sections, are provided with an internal circuit to turn an output off for a specified amount of time upon power-up. This delay is normal; it prevents a transient state when turning power on.

Optimum Performance

The optical surface of each sensor must be cleaned on a regular basis for continual superior performance. Use a soft cloth dipped in isopropyl alcohol to remove dust and moisture build-up.

IMPORTANT: Do not use organic solvents (such as thinner, ammonia, caustic soda, or benzene) to clean any part of a sensor.

All sensors experience signal inconsistencies under the influence of inductive noise. Do not use sensors in close proximity to transformers, large inductive motors, or generators. Avoid using sensors in direct contact with sources of excessive heat. Also avoid operation in close proximity to welding equipment.

Extraneous Light

Bright, extraneous light such as sunlight, incandescent lights, or fluorescent lights may impair the performance of sensors in detecting color or light.

3. SA6A ultrasonic sensors are not affected by extraneous light.

Make sure that extraneous light does not exceed recommended levels found in the individual *specifications* sections. When 500 lux is specified, this is equal to 50 footcandles. The average factory illumination is ordinarily below this level, except in areas where visual inspection is being performed. Only in such brightly lit areas is incident light of particular concern.

Unwanted light interference can often be avoided simply by making sure that the optical receiver is not aimed directly toward a strong light source. When mounting direction cannot be adjusted, place a light barrier between all nearby light sources and the receiver.

Reflected-Light Sensors

When installing sensors which detect reflected light, make sure that unwanted light reflections from nearby surfaces, such as the floor, walls, reflective machinery, or stainless steel, do not reach the optical receiver.

Also, make sure that reflected-light sensors mounted in close proximity do not cause interfering reflections. When it is not possible to maintain the recommended clearance between sensors, as noted in the individual *installation* sections, provide light barriers between sensors.

Through-Beam Sensors

A slit attachment is available to modify the beam size of through-beam sensors. This option is recommended for detecting very small objects (near the size of the smallest object which a sensor can detect) or for eliminating light interference when sensors are mounted in close proximity.

Laser Sensors

IMPORTANT: Always consider safety when installing a laser sensor of any kind. Make sure that the laser beam cannot inadvertently shine into the eyes of people passing by or working in the vicinity. See safety information on page Q-25.

Mounting

The mounting bracket and hardware are included with sensors, where applicable. Use the appropriate hardware for mounting, along with washers and spring washers or lock nuts. Do not overtighten attachment hardware. Overtightening causes damage to the housing and will adversely affect the waterproof characteristics of the sensor.

Best results can be obtained when the sensor is mounted so that the object sensed is in the center of the beam, rather than when the object is located near the edges of the sensing window. In addition, the most reliable sensing occurs when the majority of the objects being sensed are well within the sensing range, rather than at the extreme near and far limits.

1. Even though the SA6A ultrasonic sensor features protection against noise, there may be adverse effects from strong noise.

2. It is strongly recommended to avoid using any sensor where it will be continually subjected to elements which impair performance or cause corrosive damage to the sensor. In particular, avoid strong vibrations and shocks, corrosive gases, oils, and chemicals, as well as blasts of water, steam, dust, or other particles.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Wiring

Avoid running high-voltages or power lines in the same conduit with sensor signal lines. This prevents inaccurate results or damage from induced noise. Use a separate conduit when the influence of power lines or electromagnetic equipment may occur, particularly when the distance of the wiring is extended.

IMPORTANT: Connect the sensor cables and wires as noted in the individual *Wiring* sections. Failure to connect as shown in wiring diagrams will result in damage to the internal circuit.

When extending sensor cables and wires, make sure to use cables equal or superior to that recommended in the individual *specifications* sections.

When wiring terminals, be sure to prevent contact between adjoining terminals. When using ring or fork lug terminals, use the insulated sleeve style only. Each sensor terminal can accept only one ring of fork lug terminal.

On ISF series photoelectric sensors, use recommended cable, along with the attached packing gland and washer, when wiring the terminals. This ensures waterproof and dustproof characteristics.

Power Supply

Noise resistance characteristics are improved when a sensor is grounded to the 0V power terminal. If the 0V power terminal is not at ground potential, use a ceramic 0.01µF capacitor which can withstand 250V AC minimum.

When using a switching power supply, be sure to ground the FG terminal to eliminate high-frequency noise. The power supply should include an insulating transformer, not an autotransformer.

On ISF series photoelectric sensors, the power supply should be sized according to the voltage drop through the lead wire when using a long extension for the DC type (328' or 100m maximum extension).

Power Supply

The compact PS5R-A power supply is the perfect companion item for most IDEC sensors (except the SA1K—see note below). This power supply is only 1.77" (45mm) wide, 3.15" (80mm) tall, and 2.76" (70mm) deep. Call an IDEC representative for more details.

Part Number	Output Ratings
PS5R-A12	12V DC, 0.62A
PS5R-A24	24V DC, 0.32A

The SA1K full color recognition sensor requires a different power supply, such as IDEC's PS5R-B12. Call an IDEC representative for more details.

Miscellaneous

Strong magnetic fields may detract from the accuracy of the sensing measurement. Avoid mounting a sensor directly to machinery, since the housing is connected to the electronic circuit ground of the sensor. If it is necessary to mount a sensor on machinery, use the insulating plate and sleeve provided.

Glossary

Attenuation: Reduction of beam intensity as a result of environmental factors such as dust, humidity, steam, etc.

Dark on: Output energized when light is *not* detected by the receiving element. For through-beam sensors, light from the projector is not detected by the receiver when an object is present. For reflected light sensors, light is not detected when it is not reflected from an object surface.

Diffuse-reflected light sensors: Sensors that detect all scattered, reflected light. Light reflected from nearby surfaces, as well as intended object surface, is detected. Diffuse-reflected light sensors are often called "proximity switches," since they switch when any object is near. Also use to detect color contrast when colors reflect light intensity differently (green LED recommended for this application).

EEPROM: Acronym which stands for electronically erasable, programmable, read only memory.

Excess gain: Ratio of optical power available at a given projector-to-receiver range divided by the minimum optical power required to trigger the receiver.

Extraneous light: Incident light received by a sensor, irrelated to the presence or absence of object being detected. Extraneous light is usually unwanted background light such as sunlight and incandescent lamps in close proximity.

ΔE: The measurement of color difference as a three-variable function, located on an XYZ axis of light, hue, and chroma values.

Hysteresis: Operating point and release point at different levels. For solid state sensors, this is accomplished electrically. For mechanical switches, it results from storing potential energy before the transition occurs.

Light on: Output energized when light is detected by receiving element. For through-beam sensors, light from the projector is detected by the receiver when an object is not present. For reflected light sensors, light is detected when it is reflected from an object surface.

Linearity: Measurement of how nearly linear, that is, how accurate actual analog output is, with respect to distance.

NPN/PNP: Types of open collector transistors. NPN is a sink transistor; output on establishes negative potential difference. PNP is a source transistor; output on establishes positive potential difference.

Polarizing: Filtering out all reflected light except that which is projected in one plane only. Polarized retro-reflected light sensors detect the light from corner-cube type reflectors when an object is not present.

Reflected-light sensors: Sensors with the projector and receiver in one housing. Light is projected by the light source, and reflected light is received by the optical surface. Includes diffuse-reflected, retro-reflected, limited-reflected, and spot-reflected sensors.

Repeatability: Ability of a sensor to reproduce output readings consistently when the same value is applied consecutively, in the same direction, for a specified number of cycles, or for a specified time duration.

Resolution: Overall dimension of the smallest object which can be detected (when sensing the presence of an object) or smallest increment of distance which can be distinguished with reliable results (when sensing the position of an object).

Response time: Time elapsed between input and output. Total response time is the sum of object detection, amplifier response, and output response times.

Retro-reflective scan: This type of reflected light sensor uses a special reflector to return projected light when an object is not present. Sensor detects the presence of an object when the light is reflected differently.

Through-beam sensors: Sensors with a separate projector and receiver. The light source from the projector is detected by the receiver, except when an object is present.

Transient: Undesirable surge of current (many times larger than normal current) for a very short period, such as during the start-up of an inductive motor.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP