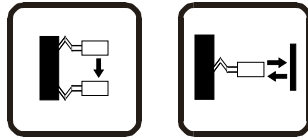


Fiber Optic Analog: SA1C-FK

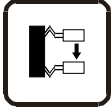
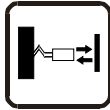
**Key features:**

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

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

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

Part Numbers

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

For information on accessories, see page 203.



Function is determined by the fiber optic unit used.

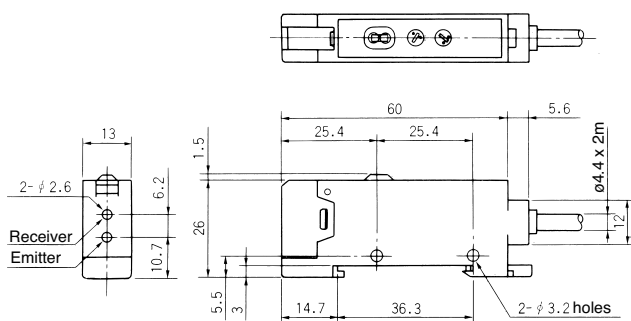
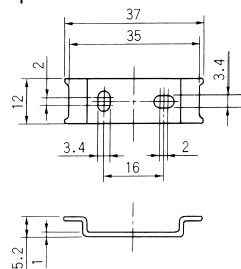
Specifications

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

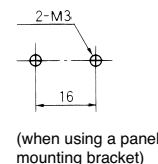


- Analog current output specification is based on the power voltage range from 12 to 24V DC (±10%). Use the attached resistor (249Ω, 1/4W) as a load resistance for converting analog output to voltage.
- Response time for analog current output is between 10% and 90% of the rise or fall of the voltage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

Dimensions (mm)

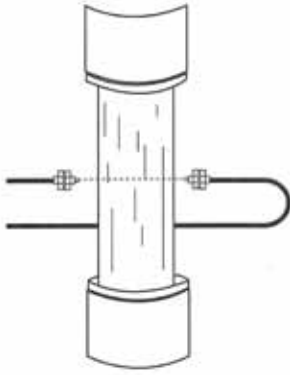
Panel Mounting Bracket (attachment)
Not required for DIN Rail mounting

Mounting Hole Layout



Applications

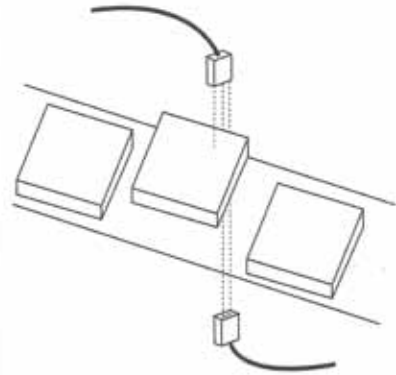
Monitoring the gradual change in liquid densities



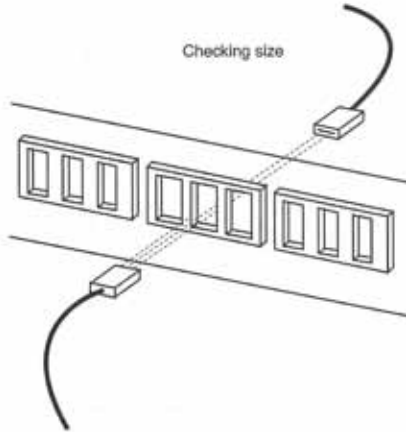
Detecting the roundness of rollers



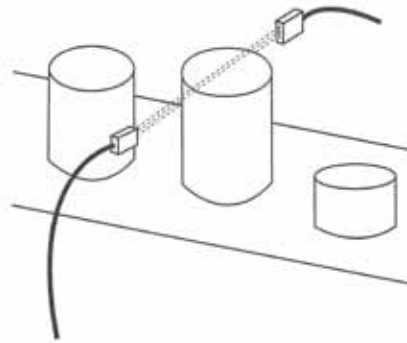
Sensing position or alignment



Checking size



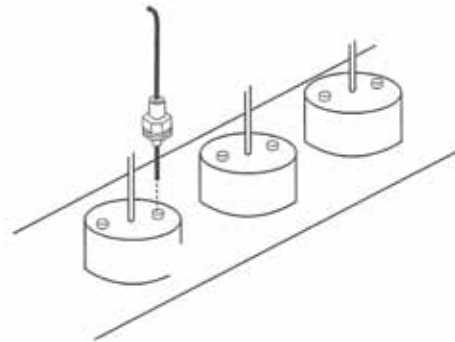
Checking height



Controlling web tension



Sensing color marks



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Barriers

Accessories


Reflectors

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









Brackets

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


Slits

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


Connector Cables (for connector model sensors)

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

Air Blower Mounting Blocks

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

Sensitivity Control Screwdriver

Item	Part No.	Package Quantity
	SA9Z-AD01	1

Diffuse-Reflected Light Fiber Optic Units - SA9F

Appearance	Part Number	Description	Use with	Range
	SA9F-DS31 No sleeve SA9F-DS32 3.54" (90mm) sleeve SA9F-DS33 1.77" (45mm) sleeve	Straight: Two fibers $\phi 1\text{mm}$ (0.04") Threaded mount: $\phi 6\text{mm}$ (M6) Detects: $\phi 0.03\text{mm}$ (0.0012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	60mm (2.36") 7mm (0.28")
	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 $\phi 1\text{mm}$ (0.04") Threaded mount: $\phi 6\text{mm}$ (M6) Detects: $\phi 0.03\text{mm}$ (0.0012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	25mm (0.98") —
	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 $\phi 0.5\text{mm}$ (0.02") Threaded mount: $\phi 3\text{mm}$ (M3) Detects: $\phi 0.03\text{mm}$ (0.0012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	20mm (0.78") —
	SA9F-DD31	Coaxial: Core $\phi 1\text{mm}$ (0.04") + 16 fibers: $\phi 0.26\text{mm}$ (0.01") Threaded mount: $\phi 6\text{mm}$ (M6) Detects: $\phi 0.03\text{mm}$ (0.0012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	60mm (2.36") 7mm (0.28")
	SA9F-DM74 1 row = 32 fibers SA9F-DM75 2 rows = 16 each (Not compatible with green LED)	Multicore: 32 fibers $\phi 0.26\text{mm}$ (0.010") Detects: $\phi 0.06\text{mm}$ (0.0024") minimum object	SA1C-FK SA1C-FK3G SA1C-F (not compatible with SA9F-DM75, SA9F-DM76)	60mm (2.36") 4mm (0.16")
	SA9F-DH21 No sleeve SA9F-DH22 3.54" (90mm) sleeve (Both not compatible with green LED)	Heat-resistant glass: Two fibers $\phi 0.7\text{mm}$ (0.03") Threaded mount: $\phi 4\text{mm}$ (M4) Detects: $\phi 0.03\text{mm}$ (0.0012") minimum object	SA1C-FK3 SA1C-FK3G SA1C-F	27mm (1.06") —

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Through-Beam Fiber Optic Units - SA9F

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

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Miscellaneous Accessories

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

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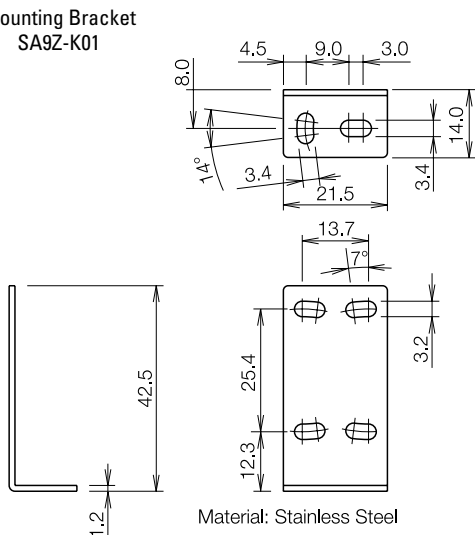
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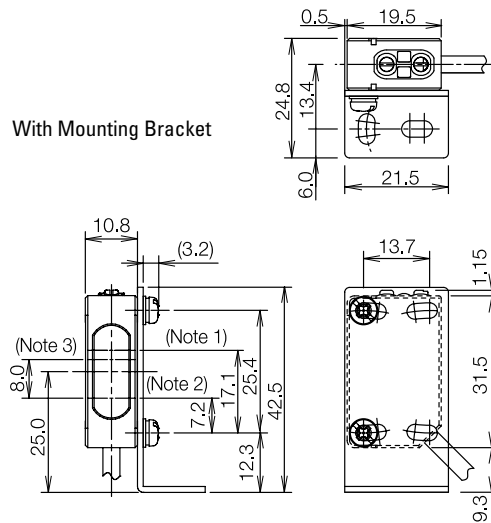
Accessory Dimensions (mm)

Mounting Bracket
SA9Z-K01



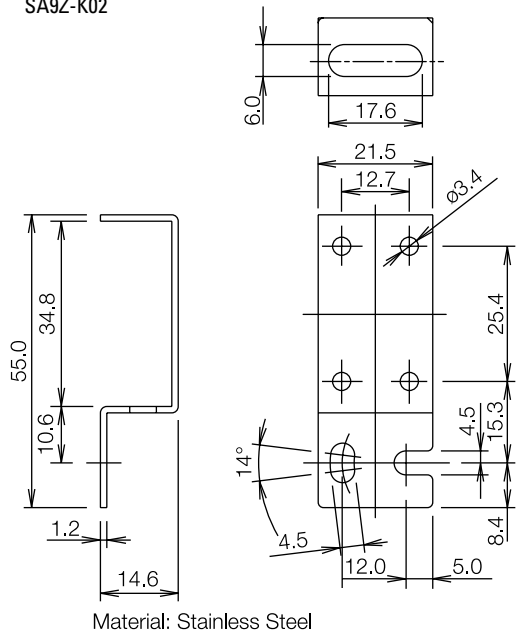
Material: Stainless Steel

With Mounting Bracket



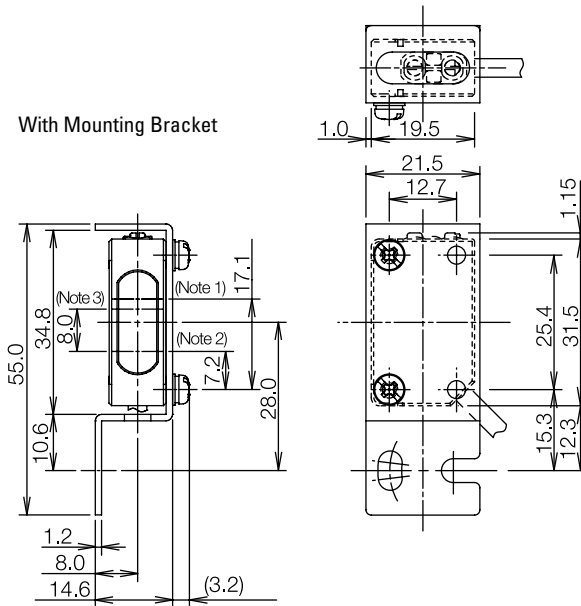
Note 1: Projector (through-beam)Receiver (through-beam)
 Note 2: Projector (polarized retroreflective, background suppression)
 Note 3: Receiver (polarized retroreflective)

SA9Z-K02



Material: Stainless Steel

With Mounting Bracket



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

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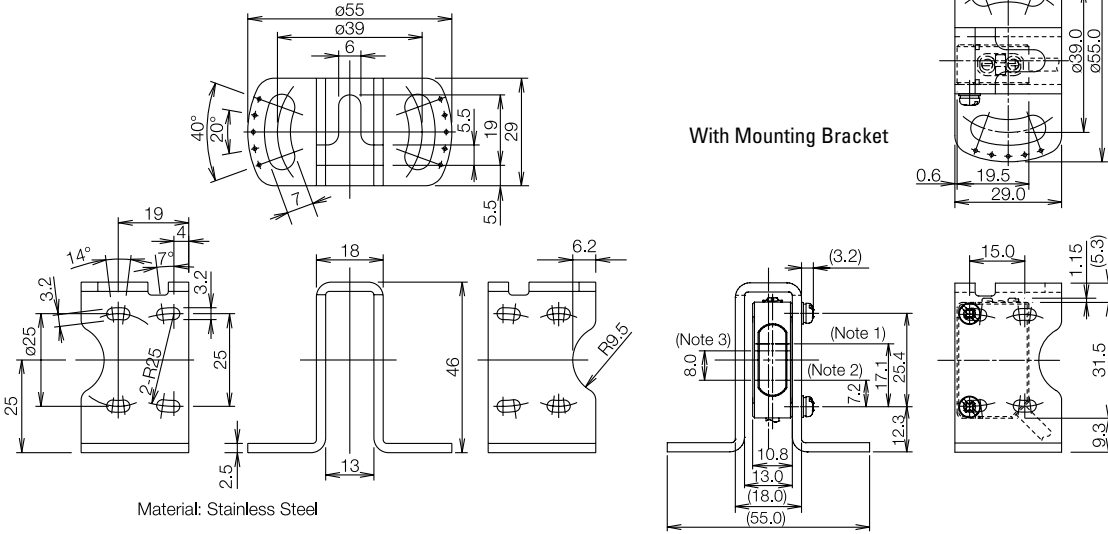
Power Supplies

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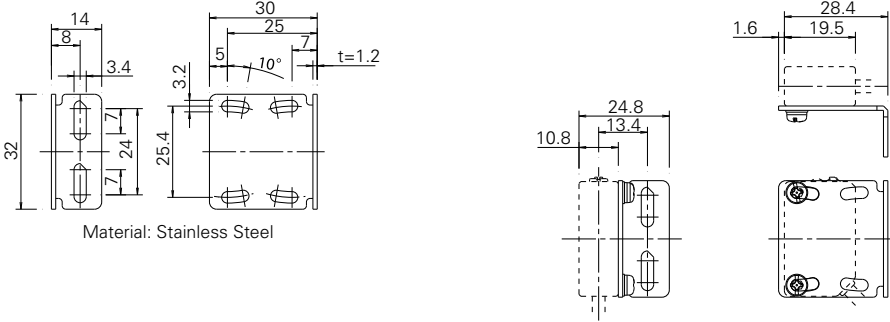
Communication

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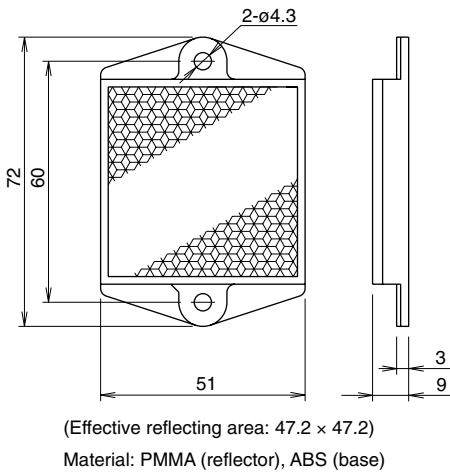
SA9Z-K03



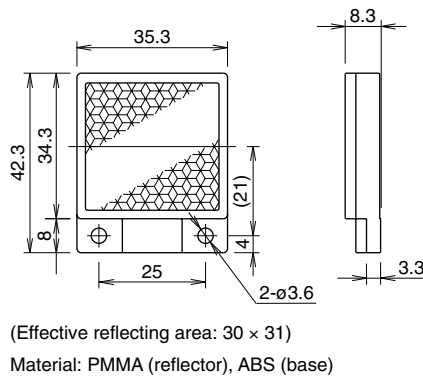
SA9Z-K04



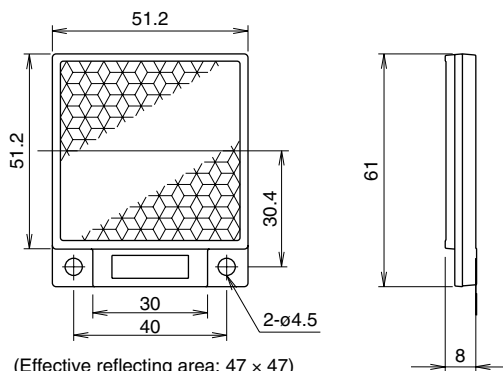
Reflector
IAC-R5



IAC-R6

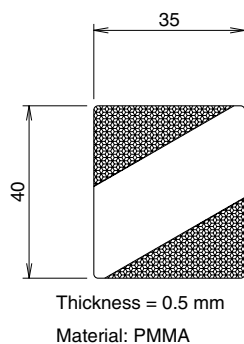


Reflector
IAC-R8

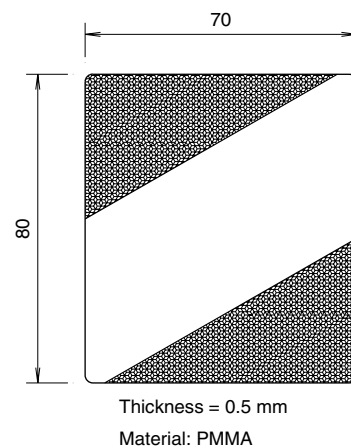


(Effective reflecting area: 47 × 47)
Material: PMMA (reflector), ABS (base)

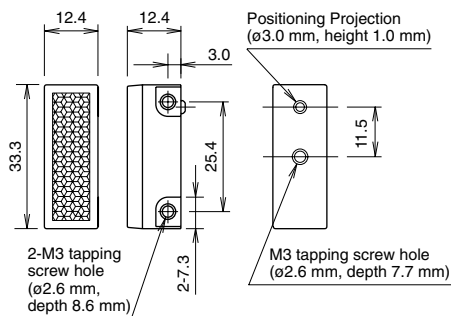
IAC-RS1



IAC-RS2



IAC-R7M (rear/side mounting)

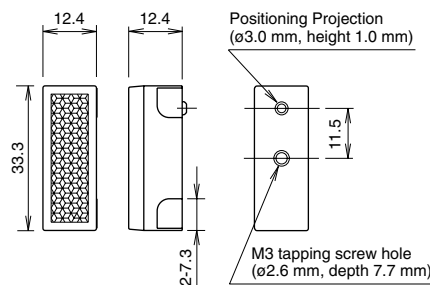


Material: PMMA (reflector), ABS (base)

Effective reflecting area: 8.6 × 29.5

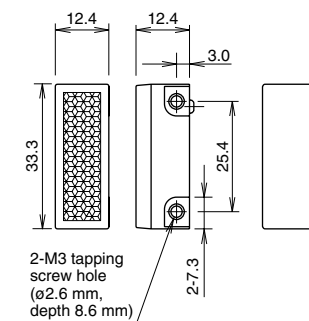
The mounting plate for reflector must be 0.8 to 2.5 mm in thickness.

IAC-R7B (rear mounting)



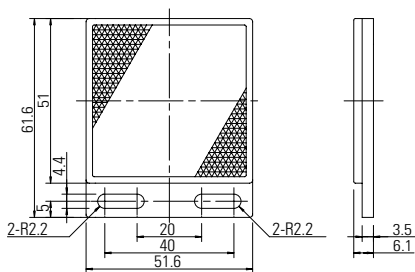
Material: PMMA (reflector), ABS (base)

IAC-R7S (side mounting)



Material: PMMA (reflector), ABS (base)

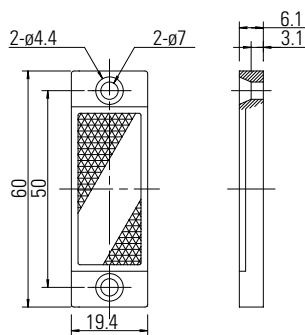
IAC-R9



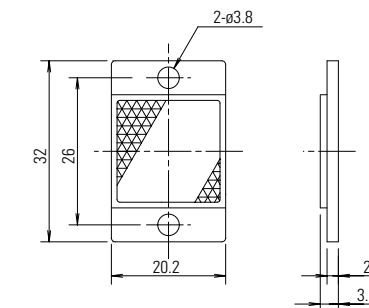
(Reflecting surface 47×47.6)

Material: PMMA (reflector), ABS (base)

IAC-R10



IAC-R11



(Reflecting surface 18×18.2)

Material: PMMA (reflector), ABS (base)

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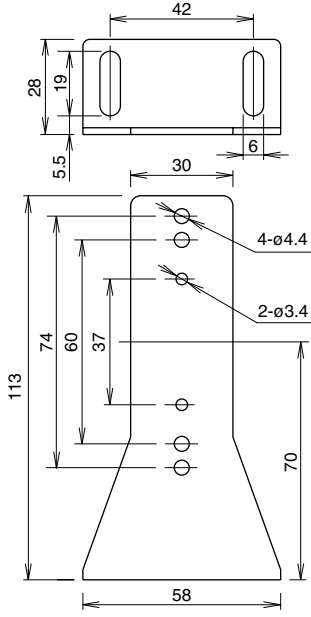
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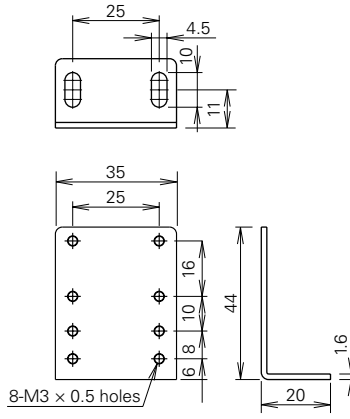
Barriers

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



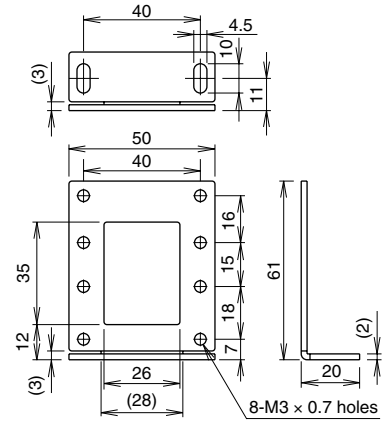
Material: SPCC (zinc chromate plating, black)

IAC-L3 (for IAC-R6)



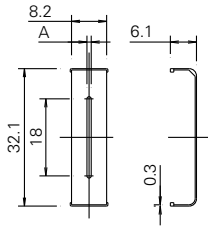
Material: SPCC (zinc plating)

IAC-L5 (for IAC-R8)



Material: SPCC (zinc plating)

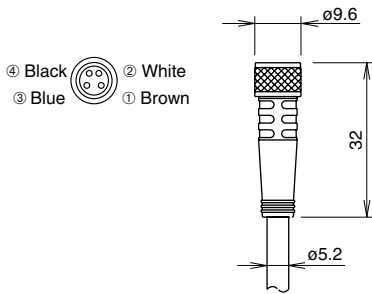
Slit (Vertical Slit)
SA9ZS06, -S07, -S08



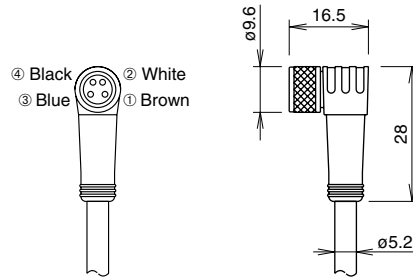
Material: Stainless Steel

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

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

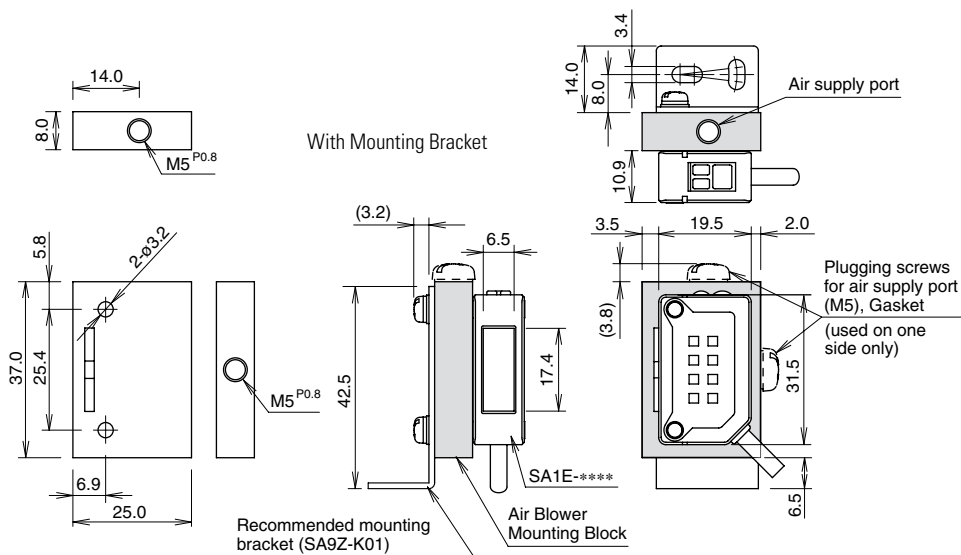


Right-angle (SA9Z-CM8K-4L□)



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

Air Blower Mounting Block

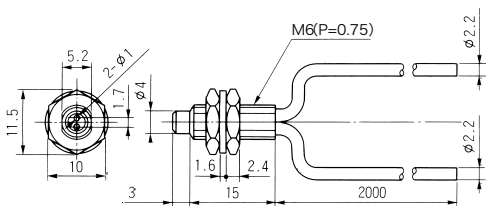


- The SA9Z-A02 air blower mounting block is supplied with two mounting screws (M3 × 20 mm sems screws), one screw for plugging the air supply port (M5 × 6 mm), and one gasket for plugging the air supply port.
- An air tube fitting (M5) can be installed to either the top or side. Tighten the fitting to a torque of 0.5 N·m maximum.
- The air tube fitting and mounting bracket are not supplied and must be ordered separately (recommended mounting bracket: SA9Z-K01).

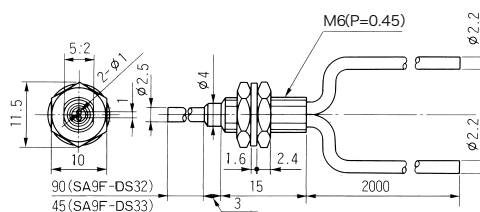
(Material: Anodized aluminum surface)

Diffuse-Reflective Light Fiber Optic Units

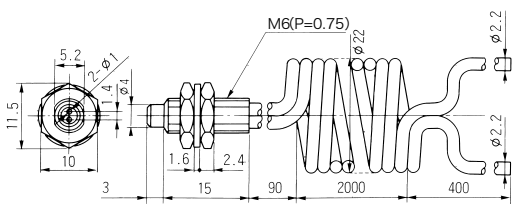
SA9F-DS31



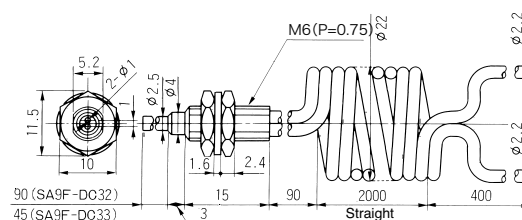
SA9F-DS32, SA9F-DS33



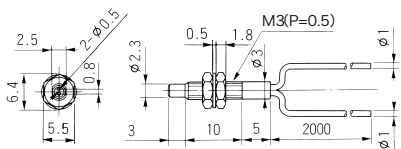
SA9F-DC31



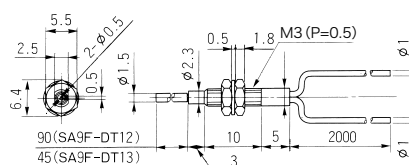
SA9F-DC32, SA9F-DC33



SA9F-DT11



SA9F-DT12, SA9F-DT13



01 Touchscreens

PLCs

Automation Software

Power Supplies

Sensors

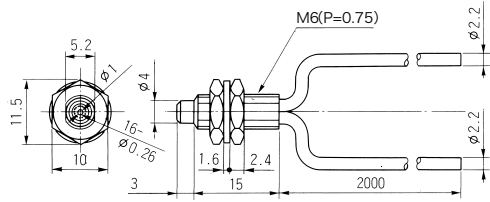
Communication

Barriers

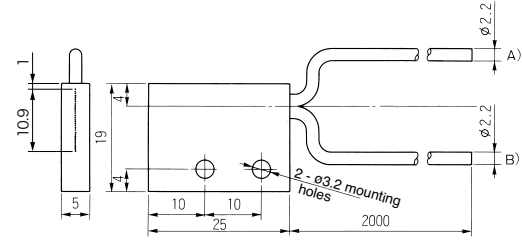
01 Touchscreens

Diffuse-Reflective Light Fiber Optic Units con't

SA9F-DD31

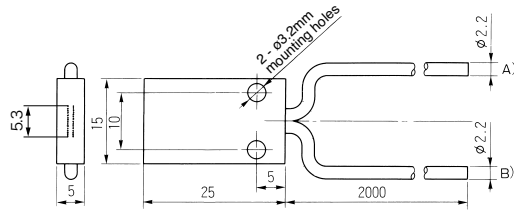


SA9F-DM74



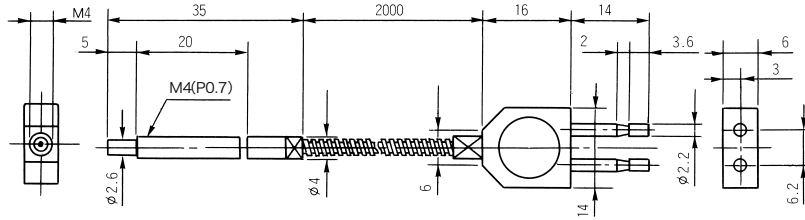
PLCs

SA9F-DM75



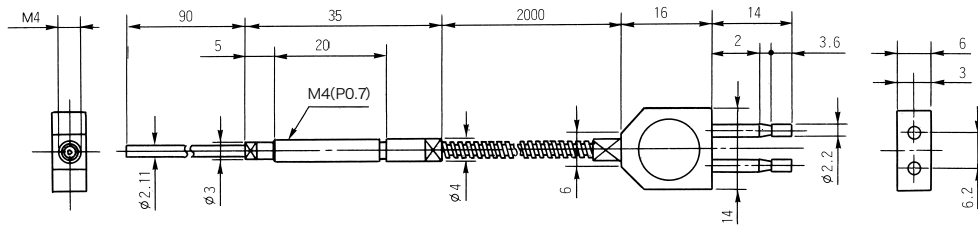
Automation Software

SA9F-DH21



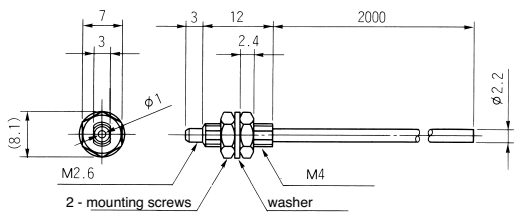
Power Supplies

SA9F-DH22



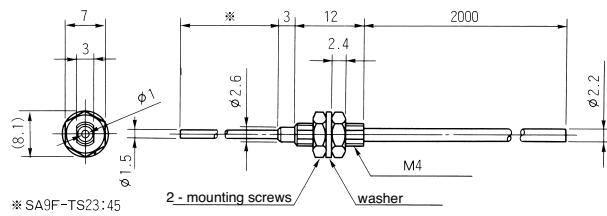
Sensors

SA9F-TS21



Communication

SA9F-TS23

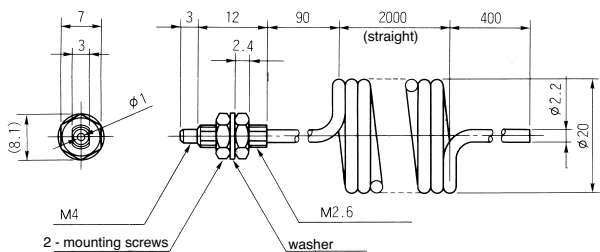


Barriers

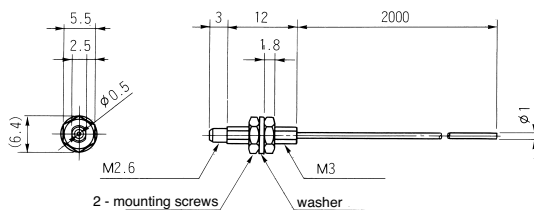
Diffuse-Reflective Light Fiber Optic Units con't

Dimensions (mm)

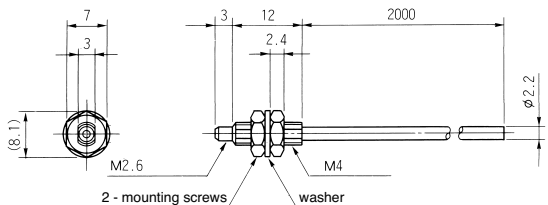
SA9F-TG21



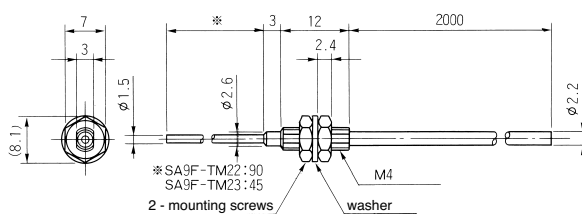
SA9F-TT11



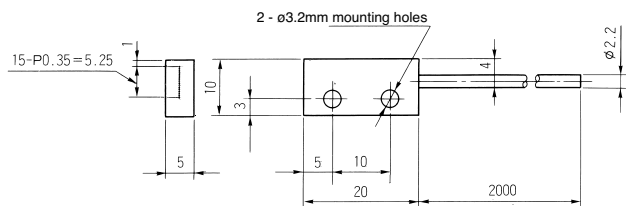
SA9F-TM21



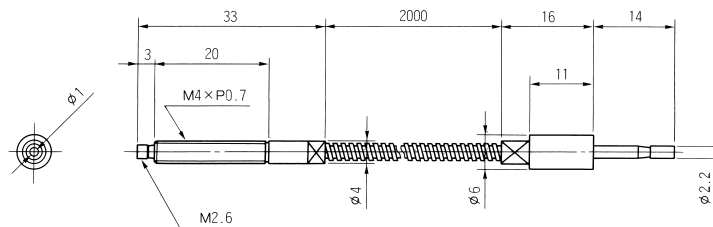
SA9F-TM22, SA9F-TM23



SA9F-TM74



SA9F-TH21



IO Touchscreens

PLCs

Automation Software

Power Supplies

Sensors

Communication

Barriers