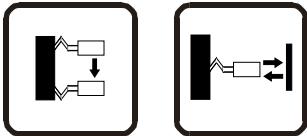


Fiber Optic Analog: SA1C-FK

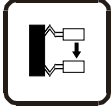
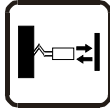


- Key features:**
- High-speed, miniature photoelectric sensors with analog (4 - 20mA) and digital output
 - Senses gradual color changes
 - Available in red or green LEDs
 - Through-beam and reflected-light sensing available
 - Ideal for either color mark applications or simple presence and absence 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

 Function is determined by the fiber optic unit used.

For information on accessories, see page 203.

Specifications

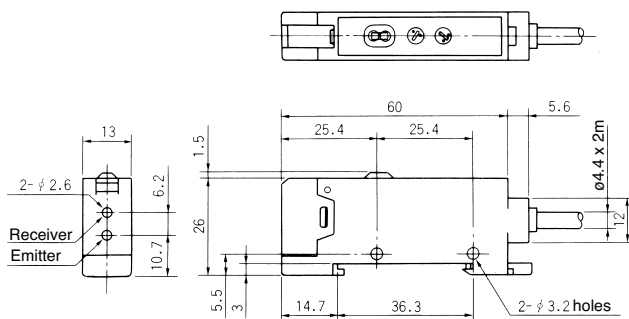
		SA1C-FK3	SA1C-FK3G
Light Source Element	Red LED	✓	—
	Green LED	—	✓
Sensing Distance	Depends on the fiber unit (see page 204)	✓	✓
Power Voltage	12 to 24V DC (Operating voltage: 10 to 30V DC) ripple 10% maximum	✓	✓
Current Draw	80mA maximum	✓	✓
Analog Current Output	4 to 20mA, 5V DC maximum ¹	✓	✓
Digital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



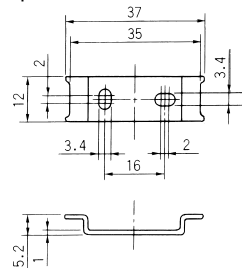
1. Analog current output specification is based on the power voltage range from 12 to 24V DC (±10%). Use the attached resistor (249Ω, 1/4W) as a load resistance for converting analog output to voltage.
2. Response time for analog current output is between 10% and 90% of the rise or fall of the voltage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



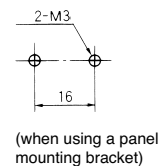
Dimensions (mm)



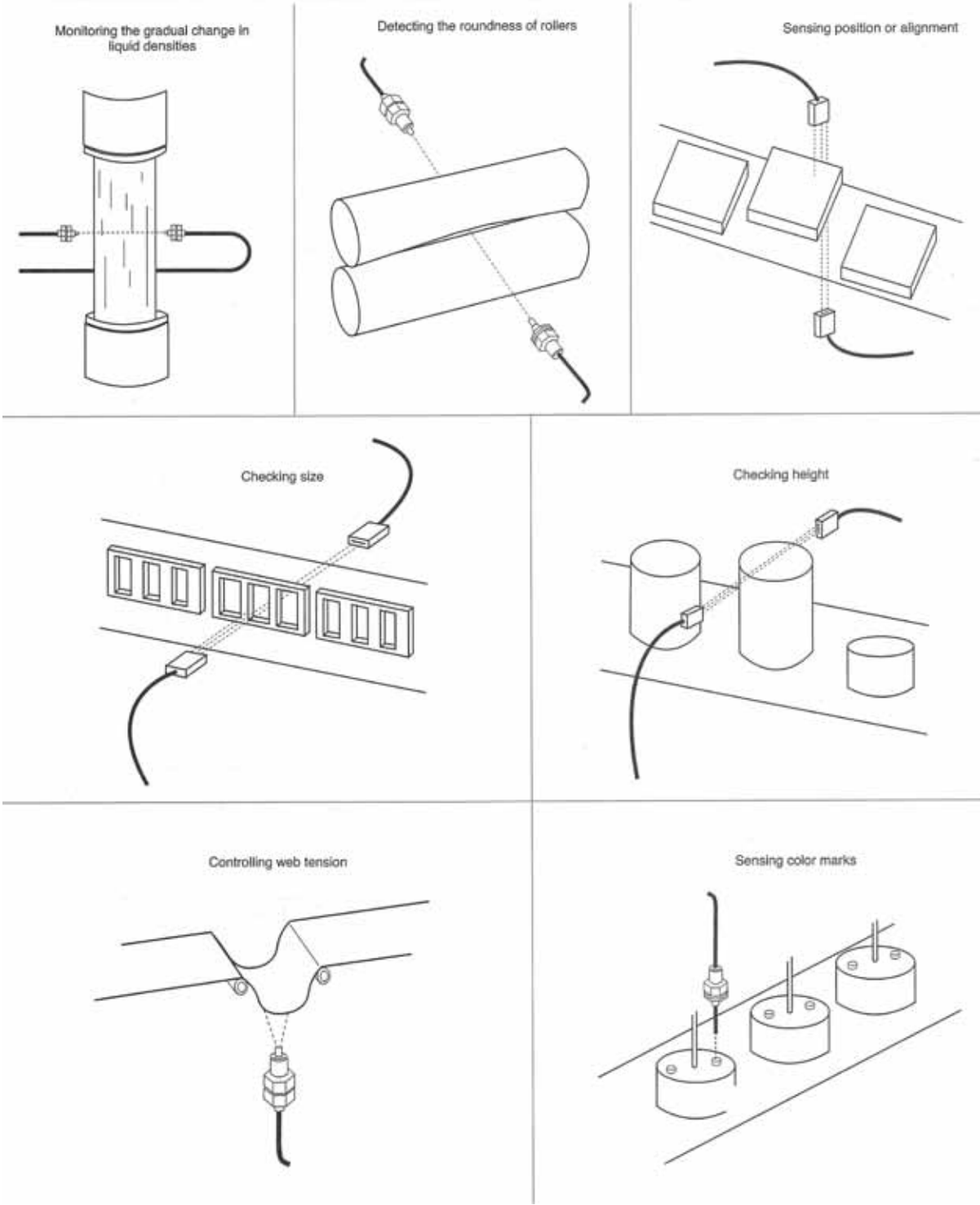
Panel Mounting Bracket (attachment)
Not required for DIN Rail mounting



Mounting Hole Layout



Applications



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
photo not available	Reflector mounting bracket		

Slits

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

Connector Cables (for connector model sensors)

Appearance	Number of Core Wires	Type & Length	Use with	Part No.
	4	Straight, 2m	SA1E	SA9Z-CM8K-4S2
		Straight, 5m		SA9Z-CM8K-4S5
		Right angle, 2m		SA9Z-CM8K-4L2
		Right angle, 5m		SA9Z-CM8K-4L5
photo not available	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
Sensitivity Control Screwdriver	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") —

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")

OI Touchscreens

PLCs

Automation Software

Power Supplies

Sensors

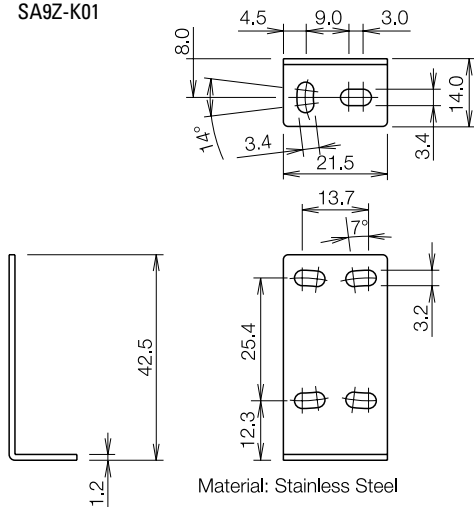
Communication

Barriers

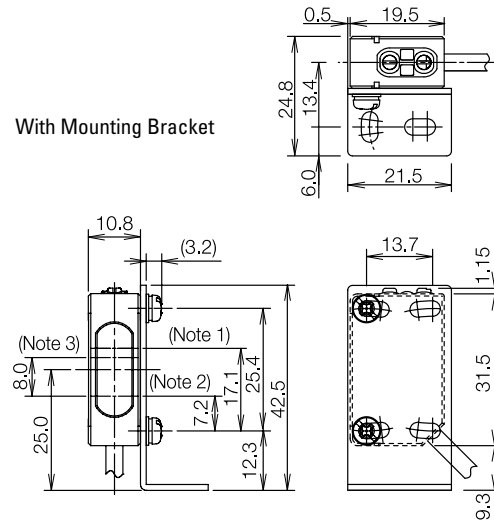
Miscellaneous Accessories

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
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
Lens attachment for long-range detection of opaque objects, minimum size: Ø 0.14" (3.5mm)	SA1C-F through-beam fiber unit only	
	Sensing ranges: Standard speed red LED: SA9F-TS21: 1.3m (4' – 3-3/16") SA9F-TC21: 1m (3' – 3-3/8") 0.1m (3.94") SA9F-TM21: 1.05m (3' – 5-3/8")	
	Sensing ranges: Standard speed green LED: SA9F-TS21: 0.135m (5.31") SA9F-TC21: 0.1m (3.94") SA9F-TM21: 0.13m (5.12")	SA9Z-F11
	Sensing ranges: High-speed red LED: SA9F-TS21: 0.4m (5.75") SA9F-TC21: 0.3m (1.81") SA9F-TM21: 0.38m (4.96")	
Side view attachment to rotate axis by 90° for detection of opaque objects, minimum size: Ø 0.14" (3.5mm)	SA1C-F through-beam fiber unit only	
	Sensing ranges: Standard speed red LED: SA9F-TS21: 200mm (7.87") SA9F-TC21: 130mm (5.12") SA9F-TM21: 160mm (6.30")	SA9Z-F12
	Sensing ranges: High-speed red LED: SA9F-TS21: 50mm (1.97") SA9F-TC21: 35mm (1.38") SA9F-TM21: 40mm (1.57")	
Side-on attachment for narrow clearance, Range: 1.26" (32mm), for detection of transparent or opaque objects	SA1C-F diffuse-reflected light fiber unit only	
	Sensing ranges: Standard speed red LED: SA9F-TS21: 35mm (1.38") SA9F-TC21: 30mm (1.81") SA9F-TM21: 35mm (1.38")	SA9Z-F13
Attachment for high-accuracy: Range: 0.4" ± 0.04" (10mm ± 1mm), for detection of transparent or opaque objects	SA1C-F through-beam fiber unit only	
	Sensing ranges: Standard speed red LED:	
	SA9F-TS21: 10mm ± 1mm SA9F-TC21: (0.394" ± 0.039") SA9F-TM21:	SA9Z-F14

Accessory Dimensions (mm)

Mounting Bracket
SA9Z-K01

With Mounting Bracket

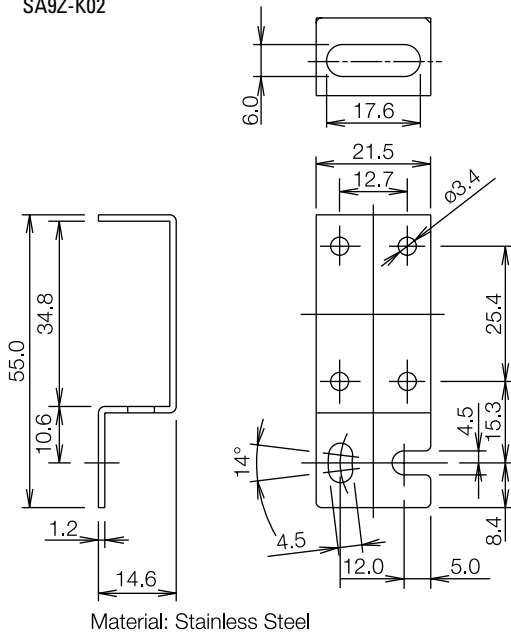


Note 1: Projector (through-beam)/Receiver (through-beam)

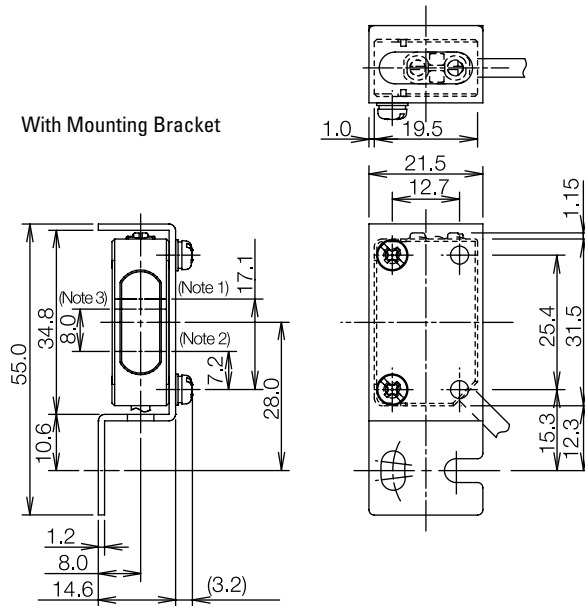
Note 2: Projector (polarized retroreflective, background suppression)

Note 3: Receiver (polarized retroreflective)

SA9Z-K02



With Mounting Bracket

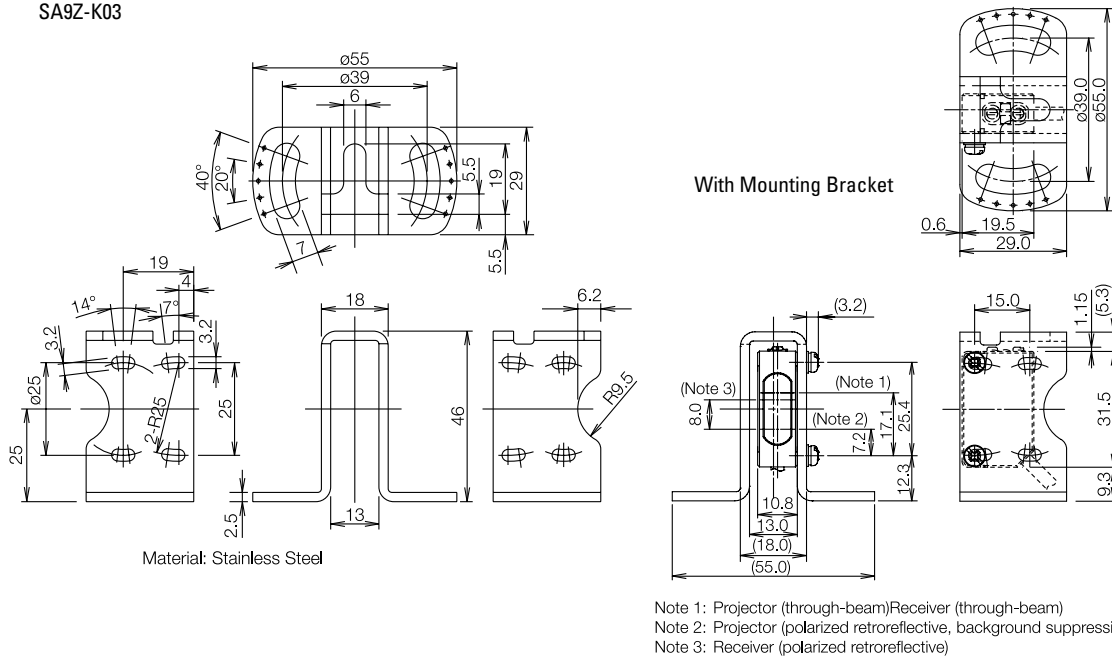


Note 1: Projector (through-beam)/Receiver (through-beam)

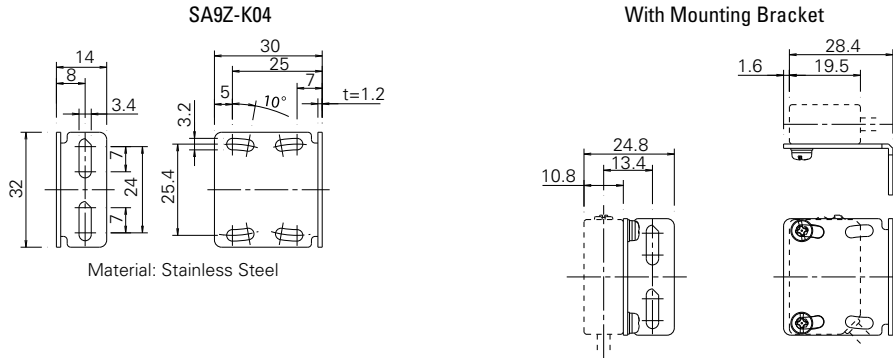
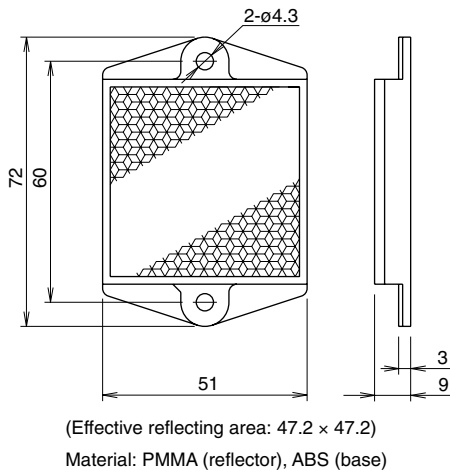
Note 2: Projector (polarized retroreflective, background suppression)

Note 3: Receiver (polarized retroreflective)

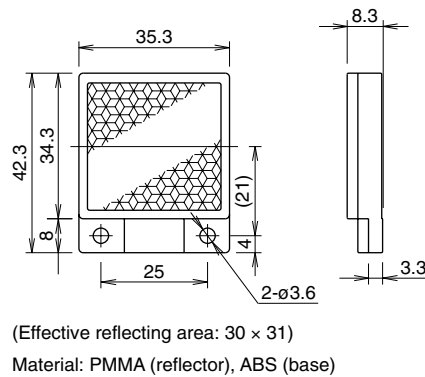
SA9Z-K03



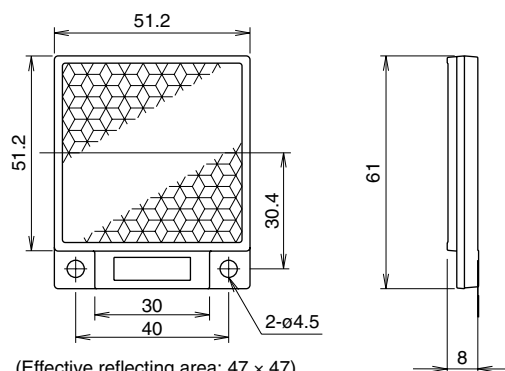
SA9Z-K04

Reflector
IAC-R5

IAC-R6



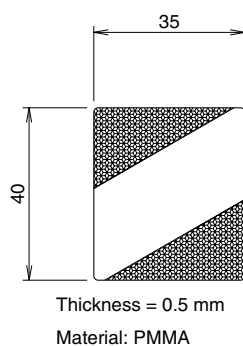
Reflector IAC-R8



(Effective reflecting area: 47 × 47)

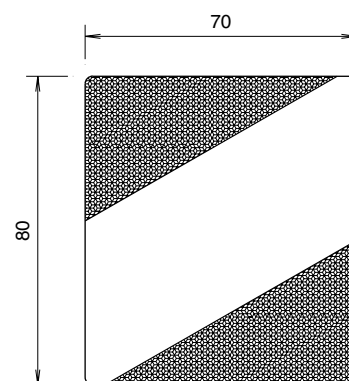
Material: PMMA (reflector), ABS (base)

IAC-RS1



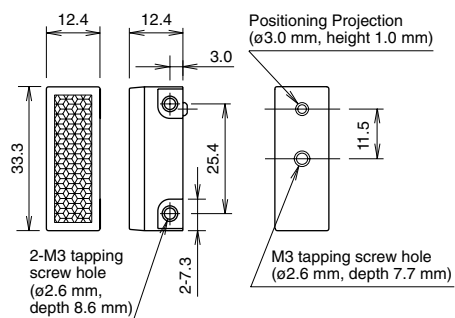
Thickness = 0.5 mm
Material: PMMA

IAC-RS2



Thickness = 0.5 mm
Material: PMMA

IAC-R7M (rear/side mounting)

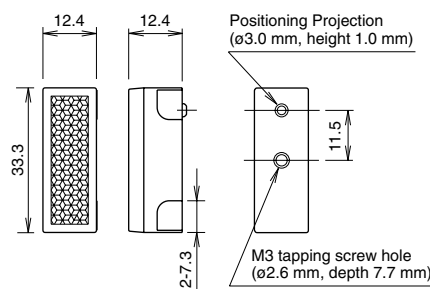


Material: PMMA (reflector), ABS (base)

Effective reflecting area: 8.6 × 29.5

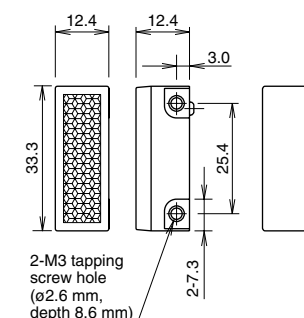
The mounting plate for reflector must be 0.8 to 2.5 mm in thickness.

IAC-R7B (rear mounting)



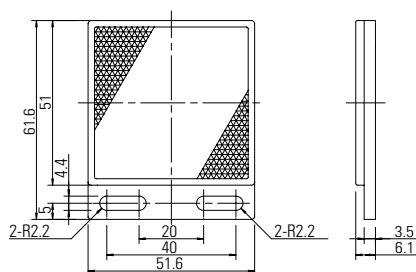
Material: PMMA (reflector), ABS (base)

IAC-R7S (side mounting)



Material: PMMA (reflector), ABS (base)

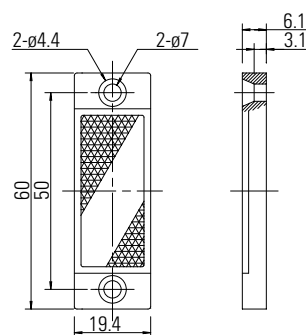
IAC-R9



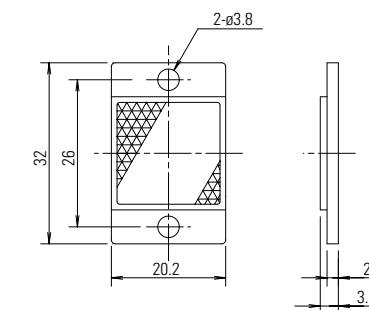
(Reflecting surface 47×47.6)

Material: PMMA (reflector), ABS (base)

IAC-R10



IAC-R11



(Reflecting surface 18×18.2)

Material: PMMA (reflector), ABS (base)

01 Touchscreens

PLCs

Automation Software

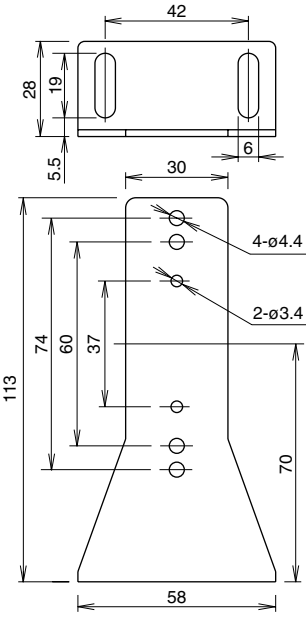
Power Supplies

Sensors

Communication

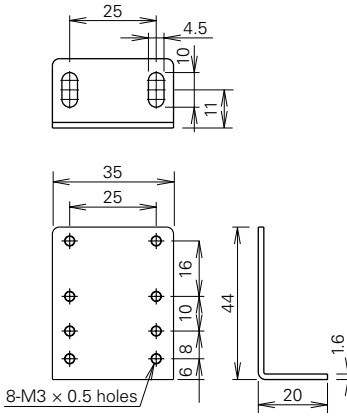
Barriers

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



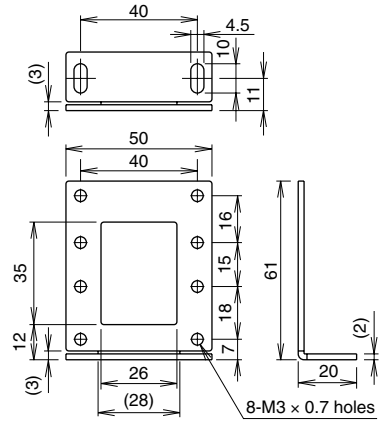
Material: SPCC (zinc chromate plating, black)

IAC-L3 (for IAC-R6)



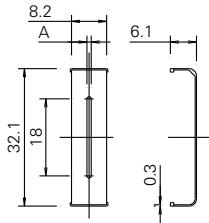
Material: SPCC (zinc plating)

IAC-L5 (for IAC-R8)



Material: SPCC (zinc plating)

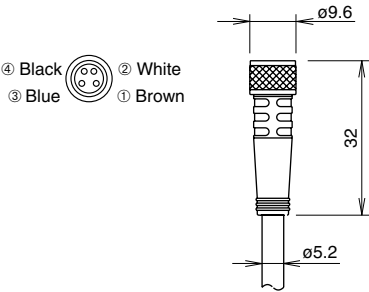
Slit (Vertical Slit)
SA9ZS06, -S07, -S08



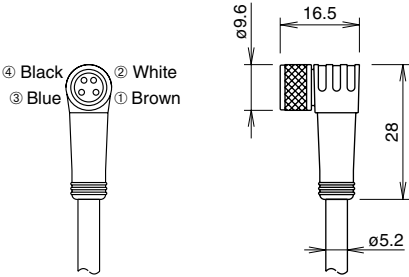
Material: Stainless Steel

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□)

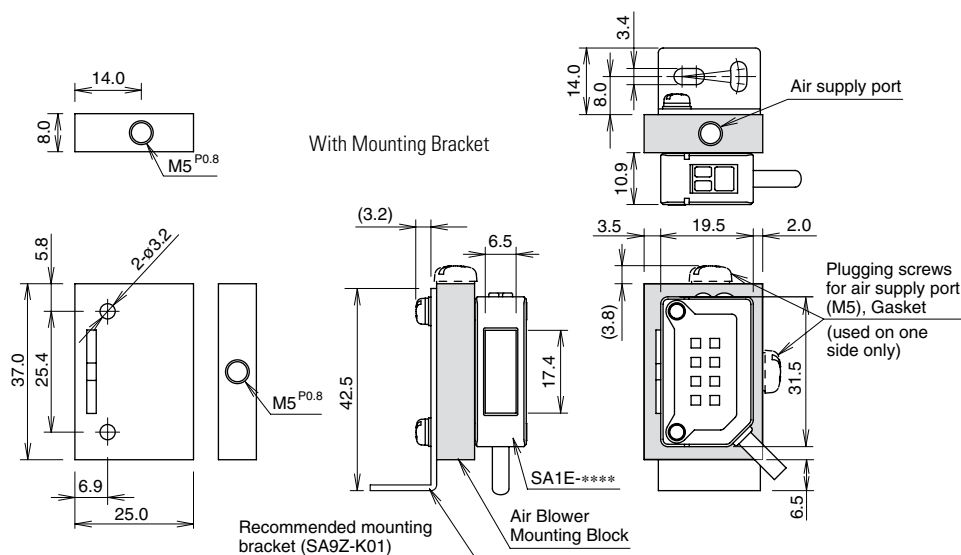


Right-angle (SA9Z-CM8K-4L□)



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

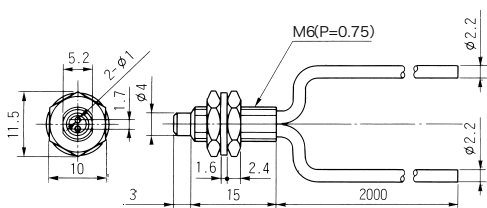
Air Blower Mounting Block



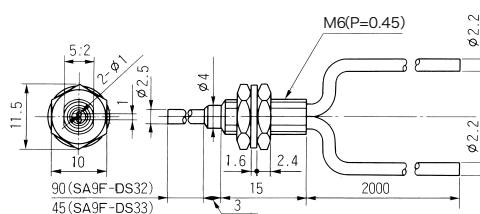
- The SA9Z-A02 air blower mounting block is supplied with two mounting screws (M3 × 20 mm sems screws), one screw for plugging the air supply port (M5 × 6 mm), and one gasket for plugging the air supply port.
- An air tube fitting (M5) can be installed to either the top or side. Tighten the fitting to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

Diffuse-Reflective Light Fiber Optic Units

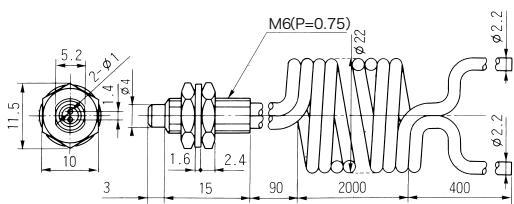
SA9F-DS31



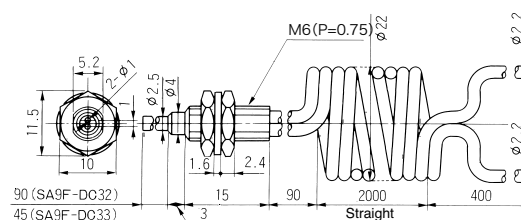
SA9F-DS32, SA9F-DS33



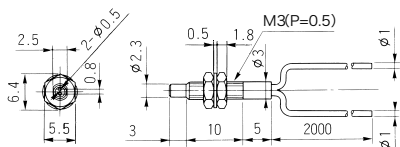
SA9F-DC31



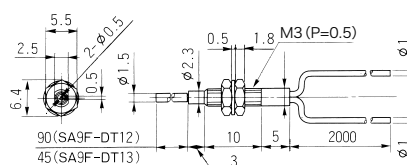
SA9F-DC32, SA9F-DC33



SA9F-DT11



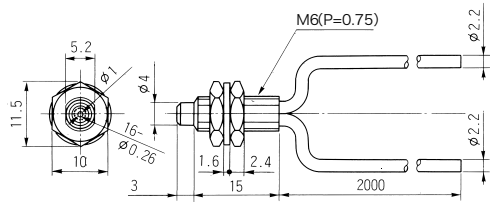
SA9F-DT12, SA9F-DT13



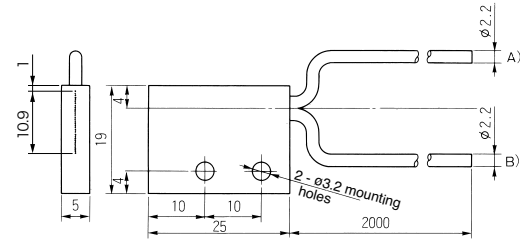
Dimensions (mm)

Diffuse-Reflective Light Fiber Optic Units con't

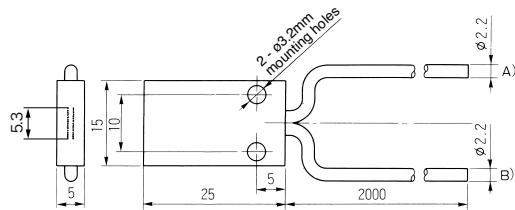
SA9F-DD31



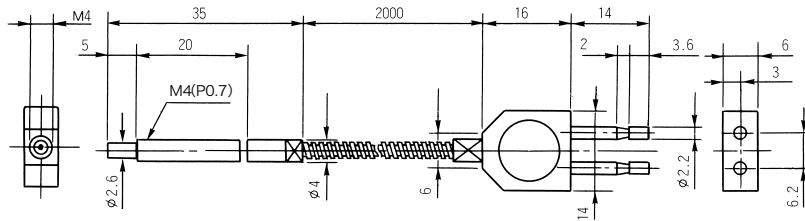
SA9F-DM74



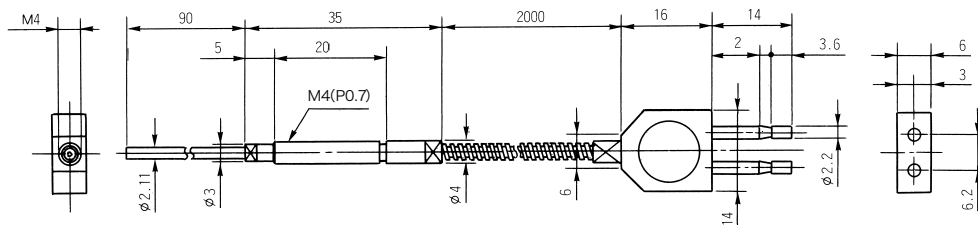
SA9F-DM75



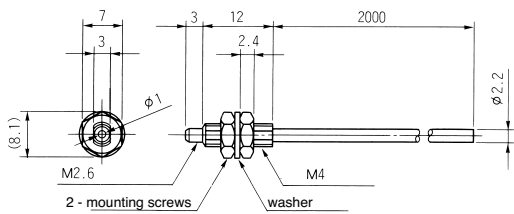
SA9F-DH21



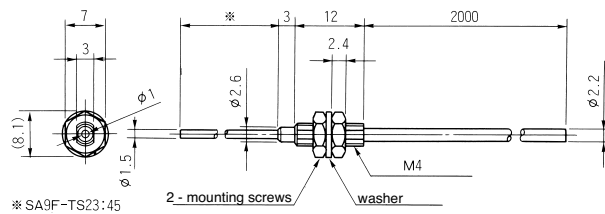
SA9F-DH22



SA9F-TS21



SA9F-TS23

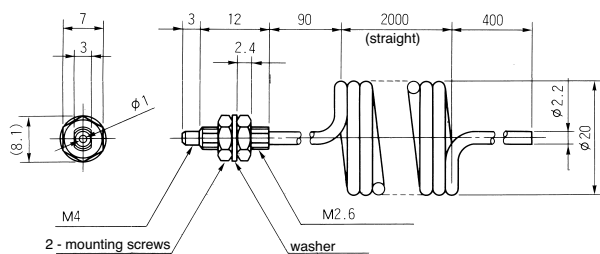


* SA9F-TS23:45

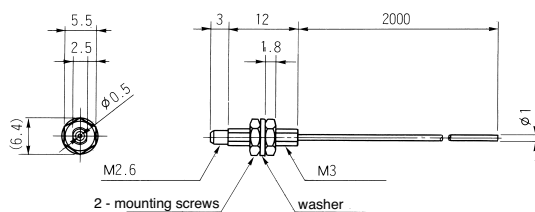
Diffuse-Reflective Light Fiber Optic Units can't

Dimensions (mm)

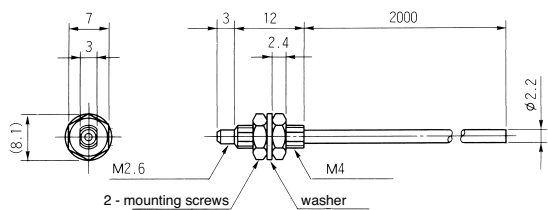
SA9F-TG21



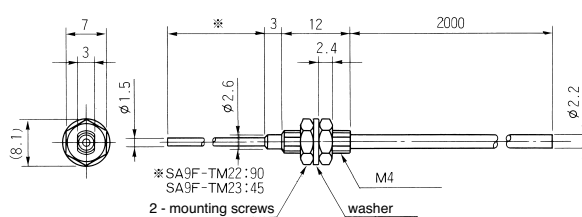
SA9F-TT11



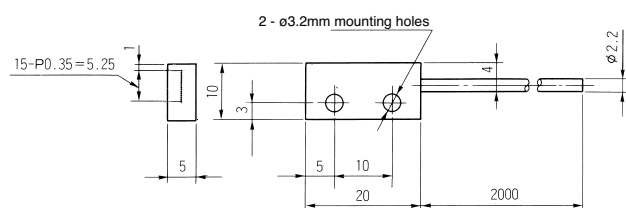
SA9F-TM21



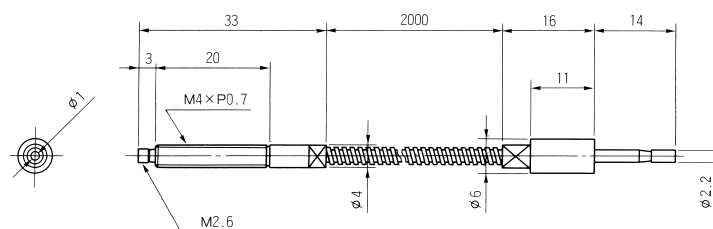
SA9F-TM22, SA9F-TM23



SA9F-TM74



SA9F-TH21



OI Touchscreens

PLCs

Automation Software

Power Supplies

Sensors

Communication

Barriers