OMRON

Analog Fiber-Optic Sensor

E3XA

Ideal for Inspection in Space-Confined Areas; Amplifier Provides Analog Output Proportional to Light Received

- Analog output ideal for position size, color and surface characteristics
- Both 4-20 mA analog and NPN transistor ON/OFF outputs available simultaneously
- Fast, 1 ms response time
- Selectable Light-ON/Dark-ON operation
- 4-turn controls allow fine adjustment of sensitivity and operating point
- 2 m (6.56 ft) of cable
- Uses standard E32 series cables– over 100 options

Ordering Information

■ SENSORS

Method of detection	Diffuse or Through-beam, depending on fiber used
Sensing distance	Refer to E32 data sheet in this catalog for specifications.
Part number	**E3XA-CC4A**

■ REPLACEMENT PARTS

Description	**Part number**
Mounting bracket (supplied with each sensor)	**E39-L52**

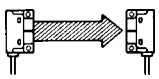
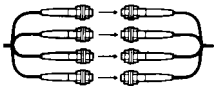
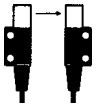
Specifications

■ E3XA AMPLIFIER

Part number			E3XA-CC4A
Required fiber-optic cable			E32-series plastic and glass filament cables, described next page (order separately)
Supply voltage			12 to 24 VDC (ripple 10% max. peak-to-peak)
Current consumption			80 mA max.
Light source (continuous)			Red LED
Operation mode			Light-ON/Dark-ON, switch selectable
Sensitivity			Adjustable, 4-turn potentiometer
Operating point			Adjustable, 4-turn potentiometer
Control output	Type	Analog	4 to 20 mA with 300 max. load impedance; 2.45 to 4 mA minimum, 20 to 21.55 mA maximum 1 to 5 VDC using 250 Ω resistor supplied. See "Connections" for conversion
		On/Off	NPN, open collector; max. load 100 mA, 30 VDC
Response time		On	1 ms max.
		Off	1 ms. max.
Variation due to temperature fluctuations			±0.3% full scale/°C
Circuit protection			Output short-circuit and reverse polarity protection
Indicators			Light incident (red LED)
			Output Operation (yellow LED)
Materials		Lens	Plastic
		Case	Plastic
		Cable sheath	Plastic
Mounting			Side surface mount with two through holes. E39-L52 bracket and mounting hardware supplied.
Connections		Cable	4-conductor cable, 2m (6.56 ft) length
Weight			140 g (5 oz)
Enclosure			IP66, IEC 144
Ambient temperature		Operating	-10°C to 55°C (14°F to 131°F)
		Storage	-30°C to 70°C (-22°F to 159°F)

■ E3XA AMPLIFIER WITH E32 FIBER-OPTIC CABLES

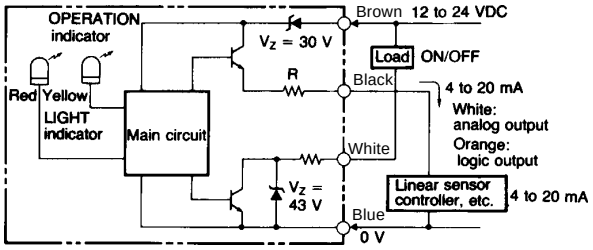
Special Application Fiber-Optic Cables (See E32 section in Sensor Catalog for more fibers)

Fiber cable number	E32-T16	E32-M21	E32-T14	E32-G14
Appearance	 10 mm wide beam	 4 pairs of heads		
Method of detection	Through-beam type			Slotted head
Sensing distance	50 cm (19.7 in) with 10 mm (3.94 in) dia. object; 40 cm (15.7 in) with 1 mm slit attached; 20 cm (7.9 in) with 0.5 mm slit attached	10 cm (3.94 in) with 2 mm (0.79 in) dia. object	8 cm (3.15 in) with 4 mm (0.16 in) dia. object	10 mm (0.39 in) with 4 mm (0.16 in) dia. object
Minumum object size	0.4 mm (0.16 in) dia. 0.35 mm (0.14 in) dia. with 1 mm slit 0.25 mm (0.10 in) dia. with 0.5 mm slit	0.3 mm (0.12 in) dia.	0.8 mm (0.03 in) dia.	0.8 mm (0.03 in) dia.
Detectable objects	Opaque	Opaque	Opaque	Opaque
Directional angle	5 to 30°	5 to 20°	5 to 60°	—

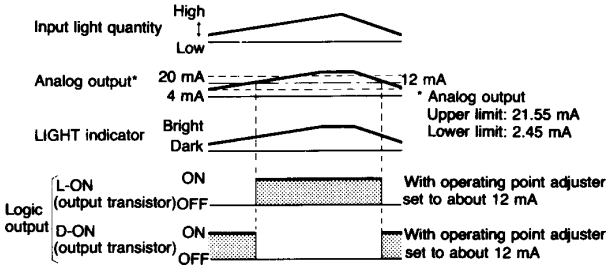
Note: For additional fiber-optic cables, see E32 fiber optic datasheet.

Operation

■ OUTPUT CIRCUIT DIAGRAM

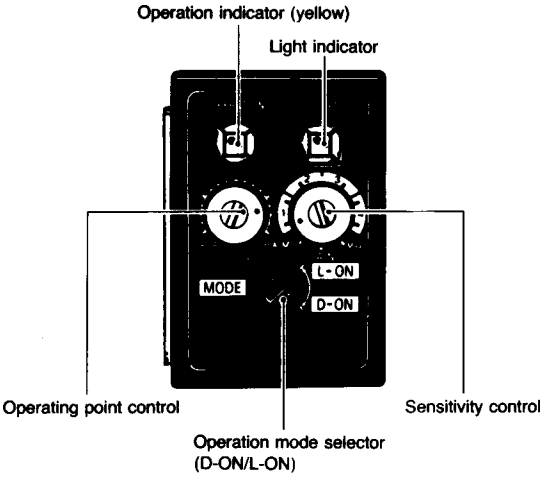


■ TIMING CHARTS



Note: The light source operates (ON) when the external diagnosis input is open; it does not operate (OFF) when the external diagnosis input is ON (Low).

■ NOMENCLATURE



■ ADJUSTMENTS

For Through-beam Fiber-Optic Cables

Using Indication:
Mount the emitter or reflector, then loosely mount the receiver. Aim the receiver to get the maximum brightness on the Light Indicator. Adjust the Sensitivity Control (gain) to maximize the brightness. Then securely mount the receiver to maintain the position.

Using Analog Output:
Use an ammeter to measure the milliamp current output from the sensor. Mount the emitter or reflector, then loosely mount the receiver. Aim the receiver to get the maximum analog output (20 mA). Move the receiver up and down, left to right to determine the area that produces maximum output. Aim the receiver in the center of that area then securely mount the receiver to maintain the position. Adjust the gain using the Sensitivity Control to produce 20 mA or the desired maximum current output.

To ensure proper adjustment for best sensitivity, be certain that the current has not become saturated above the 20 mA maximum limit. This makes normal detection impossible because the deviation of output at saturation becomes too small for differentiation.

The Easy Method:
The simple way is to use the Operation Point control. Set the operating point at 20 mA (fully clockwise), then search for the position that turns on the Operation Indicator.

For Diffuse Reflective Fiber-Optic Cables

Using Indication:
Securely mount the diffuse reflective or mark detecting sensor, or diffuse reflective fiber-optic sensing head. Place the object to be detected at the position where detection should occur. Adjust the Sensitivity Control (gain) to the point where the Operation Indicator lights. Then fine-tune the gain to maximize the brightness to the Light Indicator.

Using Analog Output:
Securely mount the diffuse reflective or mark detecting sensor, or diffuse reflective fiber-optic sensing head. Use an ammeter to measure the milliamp output from the sensor or E3XA amplifier. Place the object to be detected at the position where detection should occur. Adjust the gain using the Sensitivity Control to produce 20 mA or the desired maximum current output.

To ensure proper adjustment for best sensitivity, be certain that the current has not become saturated above the 20 mA maximum limit. This makes normal detection impossible because the deviation of output at saturation becomes too small for differentiation.

Four-Head Fiber-Optic Cable E32-M21

Using Indication:
Mount the four parts of emitters and receivers. Aim the receivers to get the maximum brightness on the Light Indicator. Adjust the Sensitivity Control (gain) to maximize brightness. Test all four pairs by interrupting each pair, one at a time, to make sure the brightness of the Light Indicator fluctuates. If the indicator brightness fails to change for any of the pairs, remount that pair and adjust the Sensitivity Control as necessary.

Using Analog Output:
Use an ammeter to measure the milliamp current output from the E3XA amplifier. Mount the four pairs of emitters and receivers. Adjust the Sensitivity Control (gain) to approximately 10 mA. Next, adjust the current values of each of the four pairs, one at a time, at maximum current (20 mA). While all four pairs are receiving light, adjust the current value to the desired level by turning the Sensitivity Control (gain).

To ensure proper adjustment for the best sensitivity, be certain that the current has not become saturated above the 20 mA maximum limit. This makes normal detection impossible because the deviation of output saturation becomes too small for differentiation.

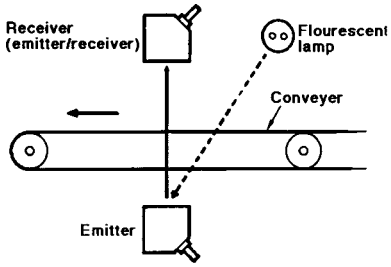
If emitter/receiver pairs are not used: If any of the emitter/receiver pairs are not used, cover them with a protective cap to block the light.

■ INFLUENCE OF FLOURESCENT LIGHTING

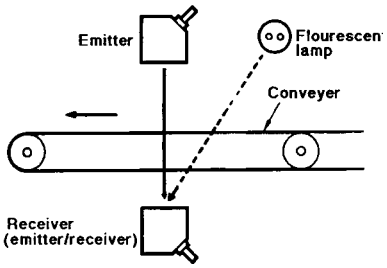
Do not allow direct exposure of flourescent light on the receiver (separate types) or emitter/receiver (reflective types). This may have adverse effects on the analog output current.

When mounting the sensor, keep the angle formed between the light of the flourescent lamp and the optical axis of the sensor at more than 15 degrees.

Correct



Incorrect



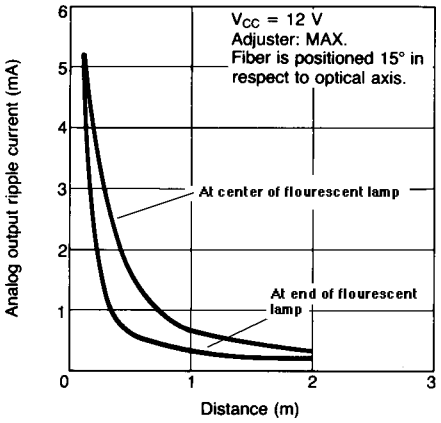
■ AMPLIFIER OUTPUTS

Analog Output
Set the analog output by allowing a hysteresis of more than 2% full scale (about 0.3 mA), also taking into account the effect of external fluctuations. This effect is already taken into account when using S3A-D and S3A2 analog sensor controllers.

Logic (On/Off) Output
The differential for the discrete On/Off logic output is set at about 2 mA. Output short-circuit protection is provided.

Engineering Data

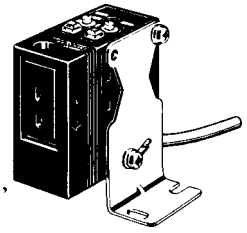
■ INFLUENCE OF EXTERNAL LIGHT INTERFERENCE

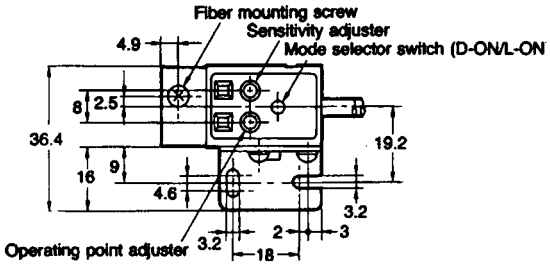


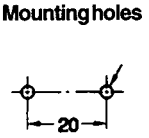
Dimensions

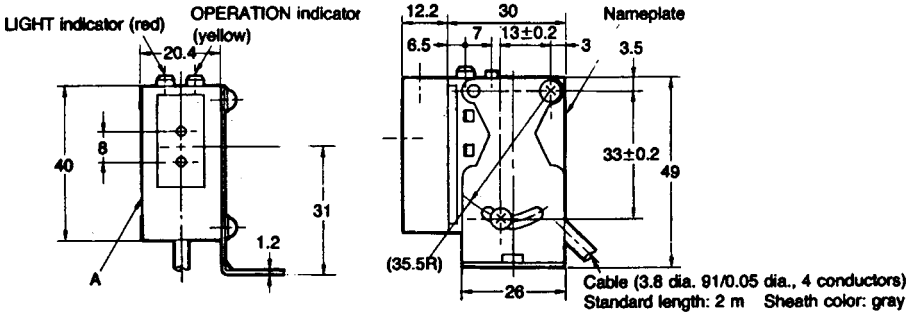
Unit: mm (inch)

Fiber-Optic Amplifier E3XA-CC4A



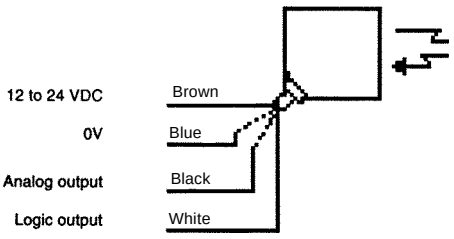






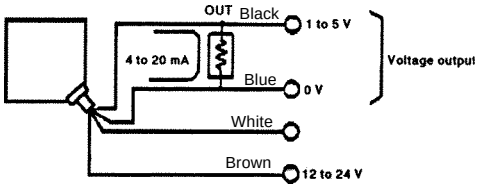
Precautions

■ CONNECTIONS



For voltage output

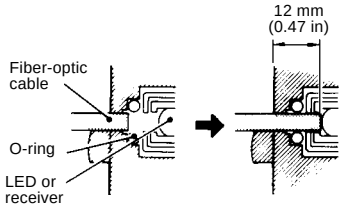
To convert output into voltage output (1 to 5 VDC), use the 250-ohm resistor supplied with the sensor.

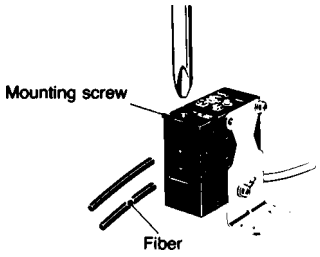


■ INSTALLING FIBER-OPTIC CABLES

Push the fibers firmly until they cannot be pushed further. The insertion depth is approximately 12 mm (0.47 in).

Tighten the fiber unit mounting screw with a Phillips screwdriver.



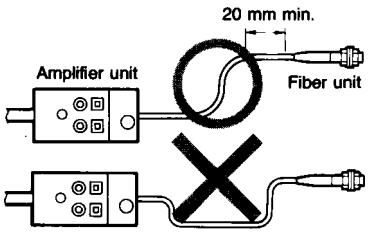


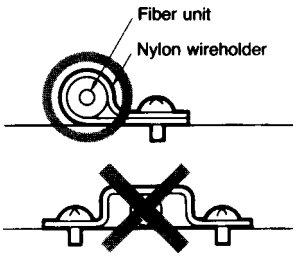
■ BENDING RADIUS OF FIBER-OPTIC CABLES

Avoid pulling or stretching the fiber unit. Do not apply a force greater than 3 kg to any fiber-optic cable. For cables E32-T16 and E32-R21 use less than 1 kg.

Keep the bending radius as large as possible, at least 20 mm (0.79 in). Do not bend the fiber unit close to the amplifier unit or sensing head.

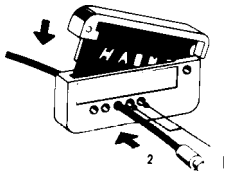
Install the fiber unit with nylon wireholders, cable ties, etc., as shown far right, so that no excessive force is directly applied to any one section of the cable.





■ FIBER-OPTIC CABLE CUTTER

Fiber optic cable must be carefully cut to ensure proper optical connection. A five-hole cutter is supplied for this precise cut. Insert the fiber cable, to the desired cutting length, into one of the previously unused holes in the cutter. Push down the blade in one strong, smooth motion. Do not re-use a hole that has been used already to cut a fiber unit. The chances of a cut surface being cut irregularly greatly increase, which would in turn shorten the cable's sensing distance.

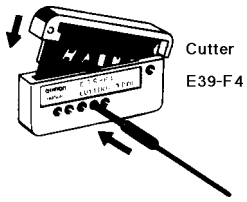


■ ATTACHMENT UNIT E39-F9 FOR THIN FIBER-OPTIC CABLES

In order to insert thin fiber-optic cables into the E3XA amplifier, use the E39-F9 attachment kit. It increases the fiber diameter to fit snugly into the mounting holes. Cut the fiber cable following these steps:

1. The attachment is shipped with the fiber cable attached as shown below.

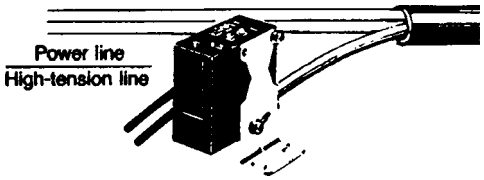
2. Adjust the projected length of the cable in the direction indicated by the arrow and securly tighten the cable.



3. Insert the cable into a hole of the E39-F4 cutter to cut it to desired length.

■ WIRING

If the input/output lines of the photoelectric sensor are placed in the same conduit or duct as power lines or high-tension lines, the photoelectric sensor may malfunction, or even be damaged, by electrical noise. Either separate the wiring or use shielded lines as input/output lines to the photo-electric sensor.



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