OMRON

Analog Photoelectric Sensor

E3SA

Analog Output Proportional to Light Received, Ideal For Inspection and Measurement

- Analog object detection ideal for position, size, color and surface characteristics
- Both analog and NPN transistor ON/OFF outputs available simultaneously
- Fast, 1 ms response time
- Selectable Light-ON/Dark-ON operation
- 4-turn sensitivity adjustment for precise control
- 2 m (6.56 ft) cable

Ordering Information

■ SENSORS

Method of detection	Through-beam	Retroreflective	Diffuse reflective	Mark sensor
Sensing distance	2 m (6.56 ft), 30 cm (11.81 in) with E39-S1 slits	20 to 50 cm (7.87 to 19.68 in)	5 to 50 cm (1.97 to 19.68 in)	2 to 5 cm (0.79 to 1.97 in)
Part number	**E3SA-2C43A**	**E3SA-RS50C43A**	**E3SA-DS50C43A**	**E3SA-VS5RC43A**

■ ACCESSORIES

Description	**Part number**
Slits for E3SA-2C43A through-beam type help detect transparent and small objects (0.5, 1, 2 and 4 mm slits; mounting hardware)	**E39-S1**

■ REPLACEMENT PARTS

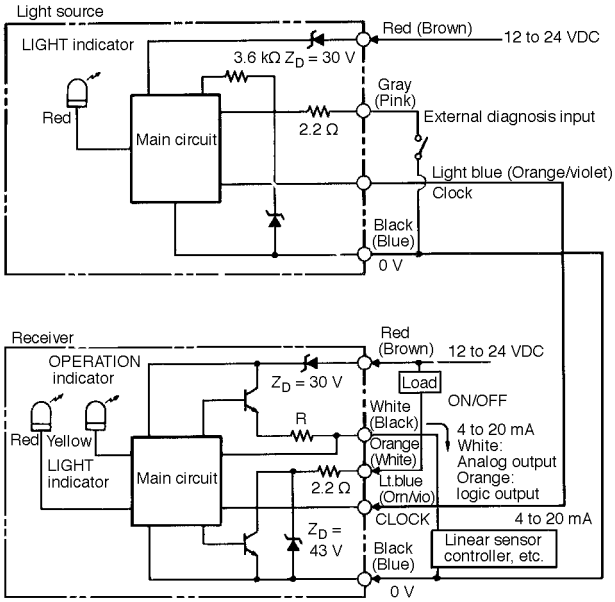
Description	**Part number**
Reflector (supplied with E3SA-RS50C43A retroreflective sensor)	**E39-R1**
Mounting bracket (supplied with each sensor)	**E39-L52**

Specifications

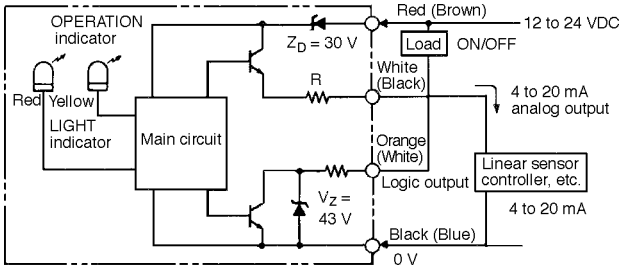
Part number			E3SA-2C43A	E3SA-RS50C43A	E3SA-DS50C43A	E3SA-VS5RC43A
Method of detection			Through-beam	Retroreflective	Diffuse reflective	Mark sensor
Supply voltage			12 to 24 VDC			
Operating voltage			10.8 to 26.4 VDC; ripple 10% max. peak-to-peak			
Current consumption			Emitter: 60 mA max. Receiver: 20 mA max.	80 mA max.		
Sensing distance			2 m (6.56 ft) 30 cm (11.81 in) with E39-S1 slits	20 to 50 cm (7.87 to 19.68 in) with E39-R1 reflector (supplied)	5 to 50 cm (1.97 to 19.68 in) with 10 x 10 cm (3.94 x 3.94 in) white mat paper	2 to 5 cm (0.79 to 1.97 in) with 3 x 3 mm (0.12 x 0.12 in) black mark on white background
Light source (continuous)			Red LED 660 nm	Polarized infrared LED	Infrared LED 950 nm	Red LED 680 nm
Light source disable input (check input)			Provided Contact closure or high solid-state input shorts power to LED; 4 V max., 2.3 mA min. source current	Not provided	Not provided	Not provided
Detectable object type			Opaque materials	Opaque materials	Opaque and transparent materials	
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 Ω 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% of full scale/°C			
Circuit protection		Output short-circuit	Provided			
		DC power supply reverse polarity	Provided			
Indicators			Emitter: Power On (red LED) Receiver: Light Incident (red LED) Output Operation (yellow LED)	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		Prewired	Emitter: 2-conductor cable, 2 m (6.56 ft) length Receiver: 5-conductor cable, 2 m (6.56 ft) length	4-conductor cable, 2 m (6.56 ft) length		
Weight			Emitter: 140 g (5 oz) Receiver: 140 g (5 oz)	140 g (5 oz)		
Enclosure		IEC 144	IP66			
Ambient temperature		Operating	-10°C to 55°C (14°F to 131°F)			
		Storage	-30°C to 70°C (-22°F to 159°F)			

■ OUTPUT CIRCUIT DIAGRAM

Through-Beam Type E3SA-2C43A



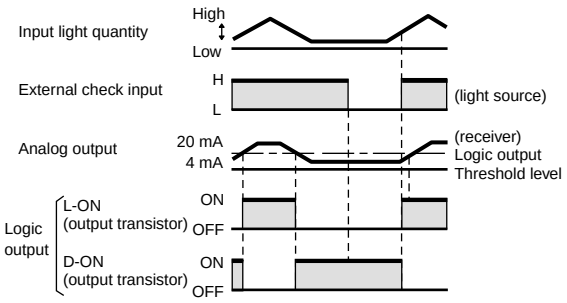
Polarized Retroreflective Type E3SA-RS50C43A
Diffuse Reflective Type E3SA-DS50C43A
Mark Sensor E3SA-VS5RC43A
Fiber-Optic Amplifier E3XA-CC4A



Note: IEC colors are shown in parentheses.

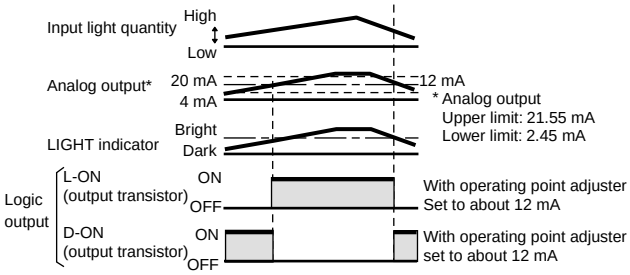
■ TIMING CHARTS

Through-Beam Type E3SA-2C43A



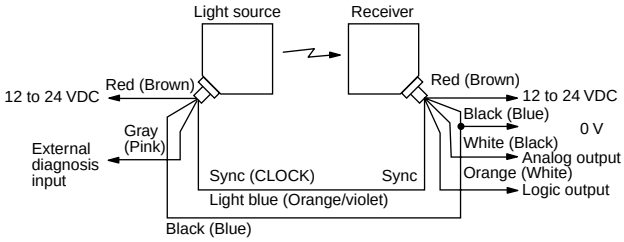
Note: The light source operates (ON) when the external check input is open; it does not operate (OFF) when the external check input is ON (Low).

Polarized Retroreflective Type E3SA-RS50C43A
Diffuse Reflective Type E3SA-DS50C43A
Mark Sensor E3SA-VS5RC43A
Fiber-Optic Amplifier E3XA-CC4A

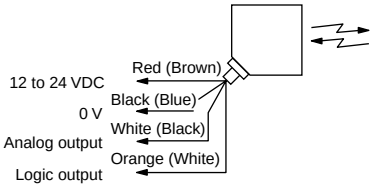


Connections

Through-Beam Type E3SA-2C43A

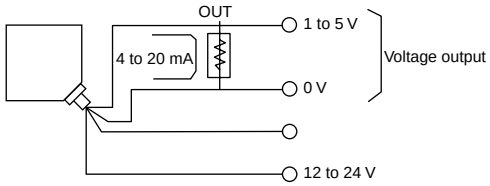


Polarized Retroreflective Type E3SA-RS50C43A
Diffuse Reflective Type E3SA-DS50C43A
Mark Sensor E3SA-VS5RC43A



Note: IEC colors are shown in parentheses.

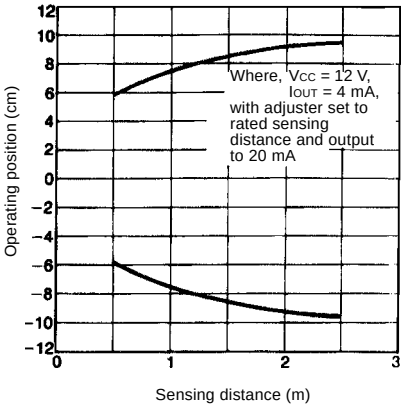
For voltage output (1 to 5 VDC)
To convert current output into voltage output (1 to 5 VDC), use the 250-ohm resistor, supplied with the sensor.



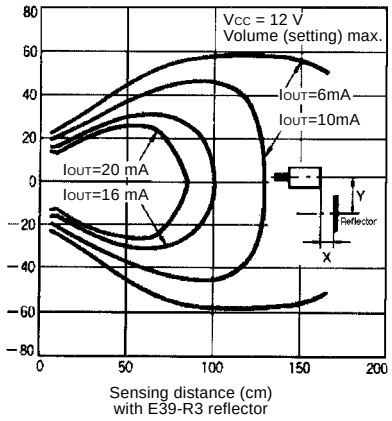
Engineering Data

■ OPERATING RANGE

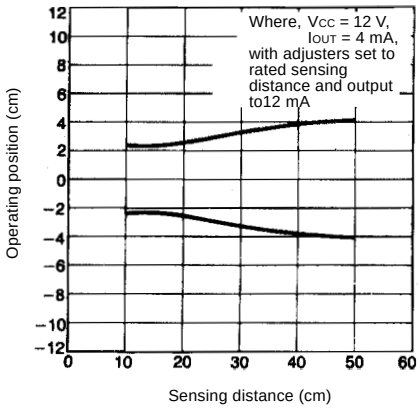
Through-Beam Type E3SA-2C43A without slit



Polarized Retroreflective Type E3SA-RS50C43A

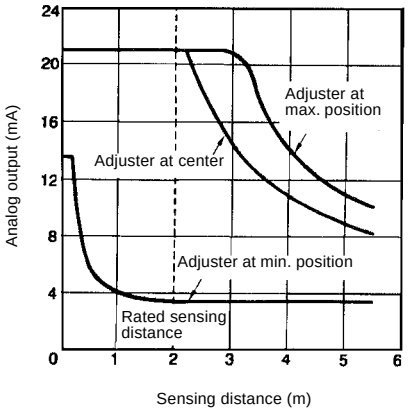


Diffuse Reflective Type E3SA-DS50C43A

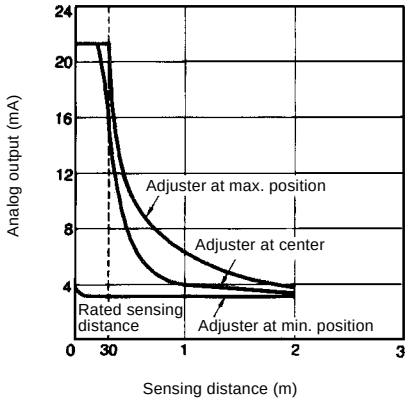


■ DISTANCE vs. ANALOG OUTPUT CURRENT

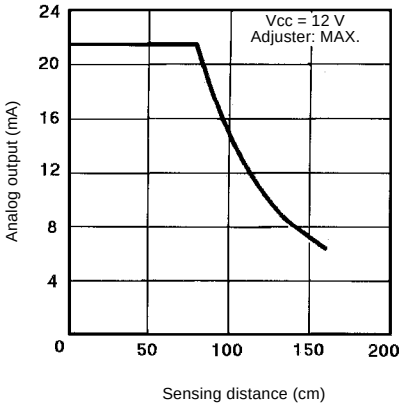
Through-Beam Type E3SA-2C43A without slit



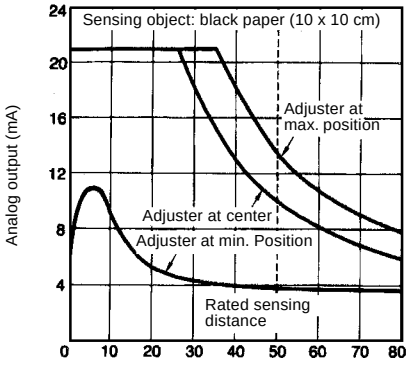
Through-Beam Type E3SA-2C43A with slit



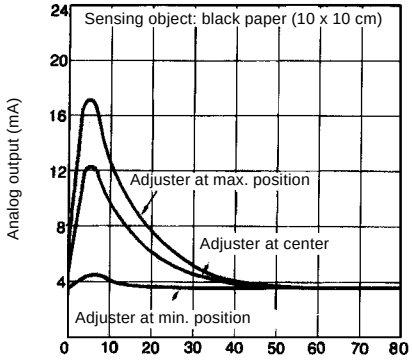
Polarized Retroreflective Type E3SA-RS50C43A



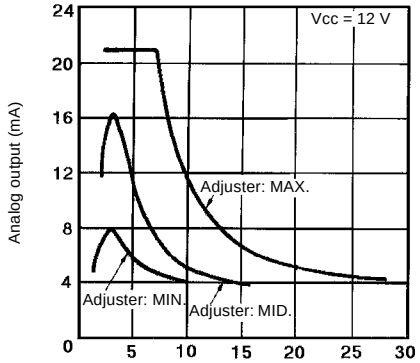
Diffuse Reflective Type E3SA-DS50C43A (white object)



Diffuse Reflective Type E3SA-DS50C43A (black object)

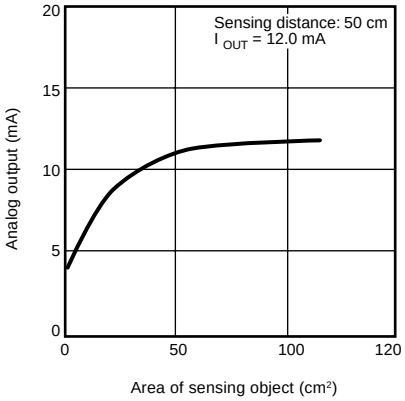


Mark Sensor Type E3SA-VSRC43A

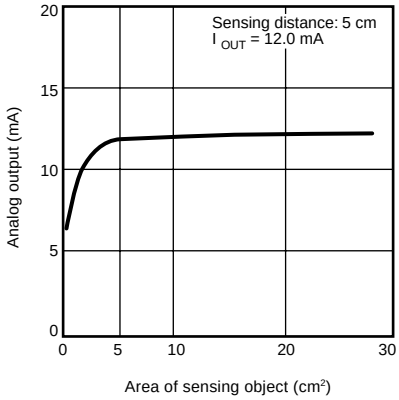


■ OBJECT SIZE vs. OUTPUT

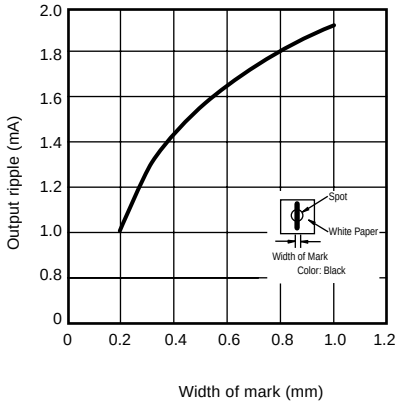
Diffuse Reflective Type E3SA-DS50C43A



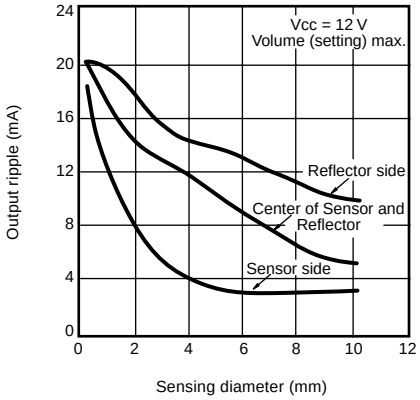
Diffuse Reflective Type E3SA-DS50C43A



Mark Sensor Type E3SA-VSRC43A

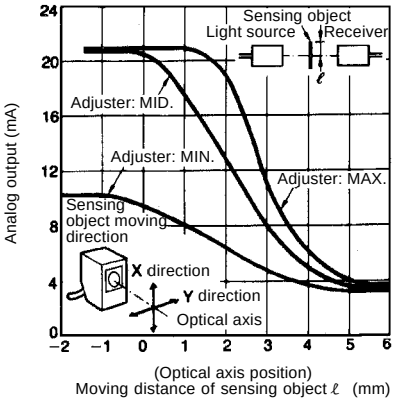


Polarized Retroreflective Type
E3SA-RS50C43A

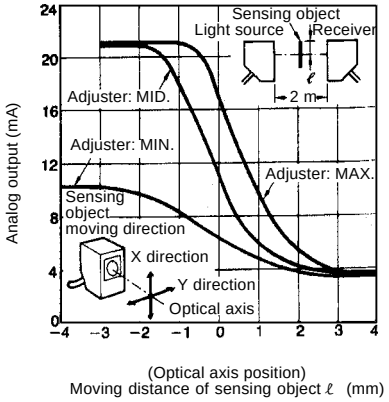


■ LIGHT INTERRUPTING CHARACTERISTICS

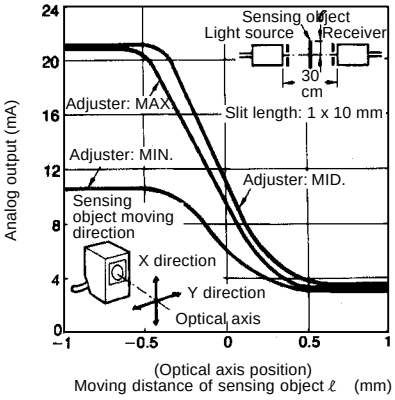
Through-Beam Type E3SA-2C43A
Without Slit, in Y Direction



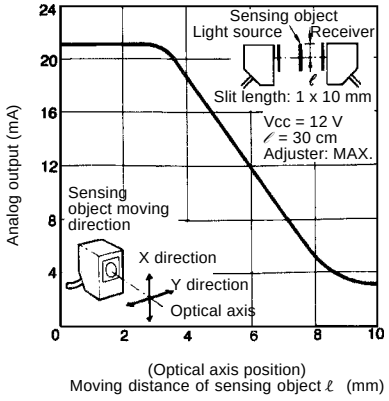
Through-Beam Type E3SA-2C43A
Without Slit, in X Direction



Through-Beam Type E3SA-2C43A
With Slit, in Y Direction

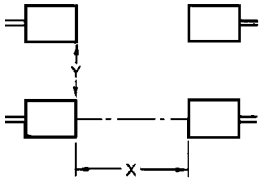


Through-Beam Type E3SA-2C43A
With Slit, in X Direction

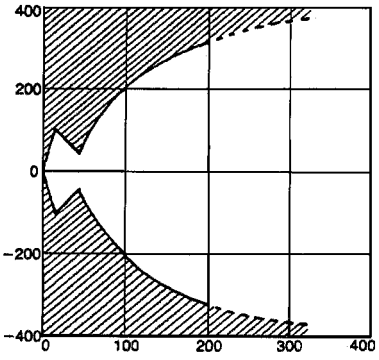


■ MUTUAL INTERFERENCE

If sensors are installed side by side, provide at least the minimum distance shown in the shaded region of the following charts between sets of fibers to prevent mutual interference.

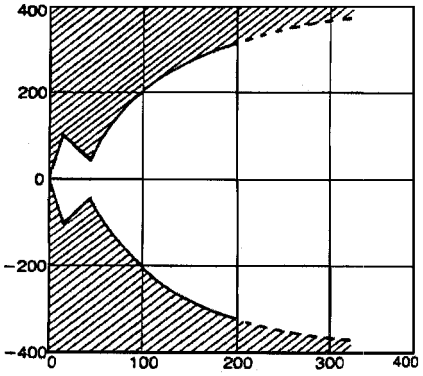


Through-Beam Type
E3SA-2C43A Without Slit



Sensing distance X (cm)

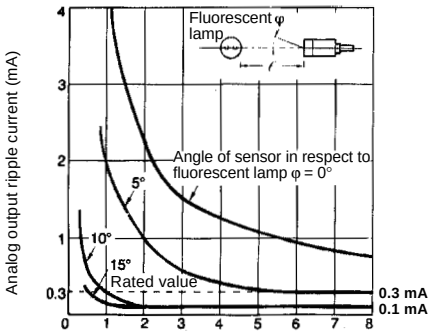
Through-Beam Type
E3SA-2C43A With Slit



Sensing distance X (cm)

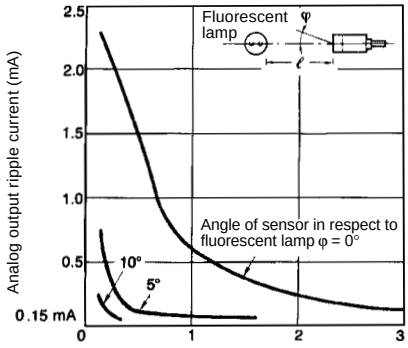
■ INFLUENCE OF EXTERNAL LIGHT INTERFERENCE

Through-Beam Type
E3SA-2C43A Without Slit



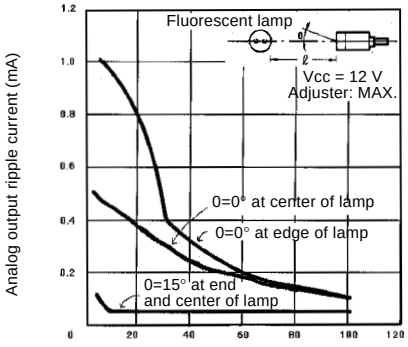
Distance from fluorescent lamp ℓ (m)

Through-Beam Type
E3SA-2C43A With Slit



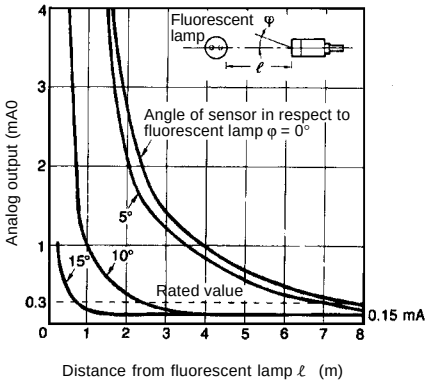
Distance from fluorescent lamp ℓ (m)

Retroreflective Type
E3SA-RS50C43A



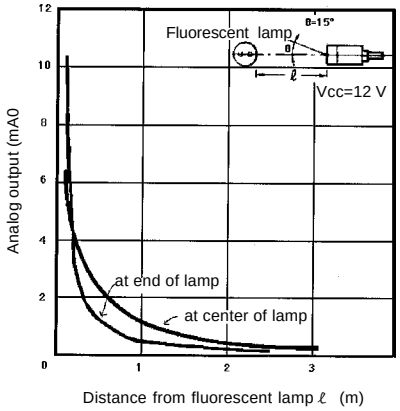
Distance from fluorescent lamp ℓ (cm)

Diffuse Reflective Type
E3SA-DS50C43A



Distance from fluorescent lamp ℓ (m)

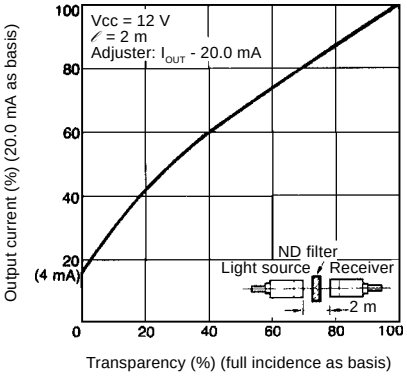
Diffuse Reflective Type
E3SA-VS5RC43A



Distance from fluorescent lamp ℓ (m)

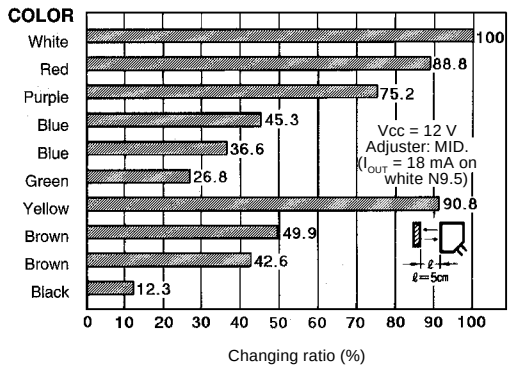
■ TRANSPARENCY AND COLOR vs. ANALOG OUTPUT

Through-Beam Type E3SA-2C43A
Without Slit

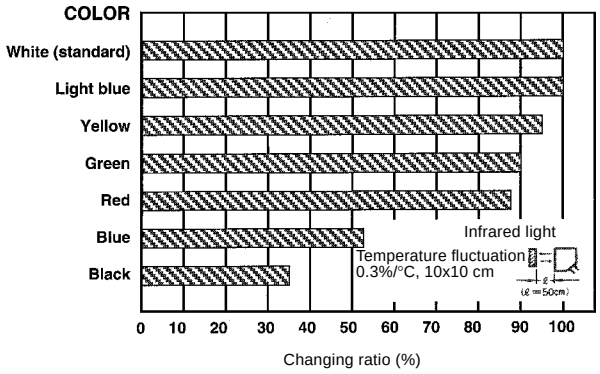


■ COLOR MARK DETECTION CAPABILITY

Mark Sensor Type E3SA-VS5RC43A



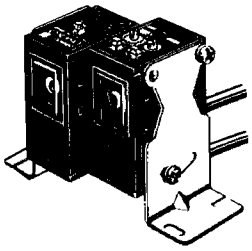
Diffuse Reflective Type E3SA-DS5C43A

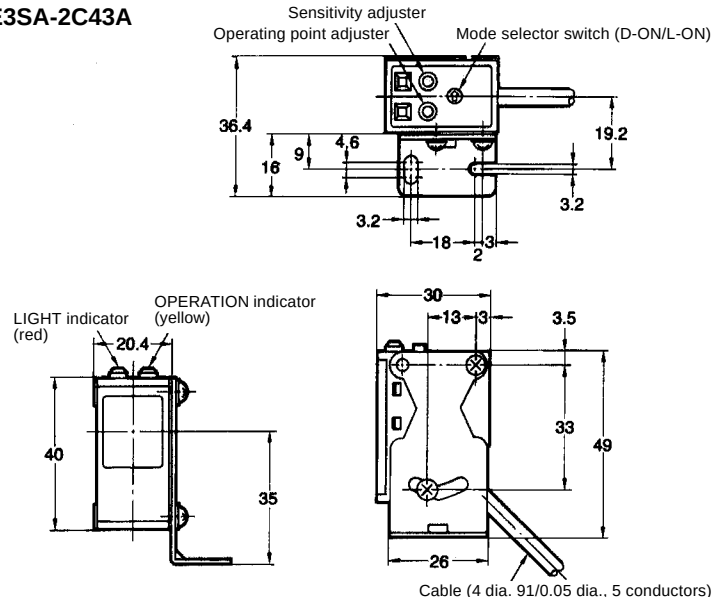


Dimensions

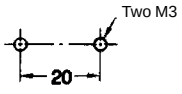
Unit: mm (inch)

Through-Beam Type E3SA-2C43A

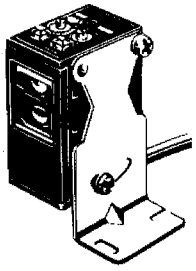


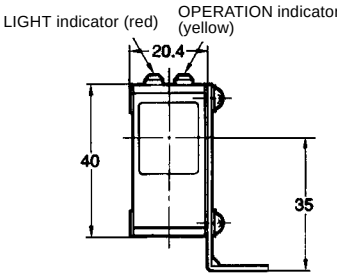


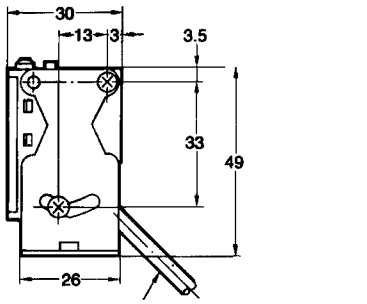
Mounting holes



Retroreflective Type E3SA-RS50C43A (included E39-R1 reflector)
Diffuse Reflective Type E3SA-DS50C43A
Mark Sensor E3SA-VS5RC43A

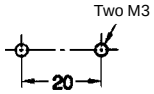






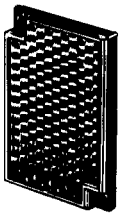
Cable (3.8 dia. 91/0.05 dia., 4 conductors)
Standard length: 2 m
Sheath color: gray

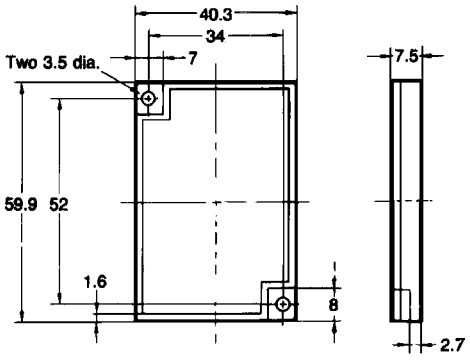
Mounting holes



■ REFLECTORS

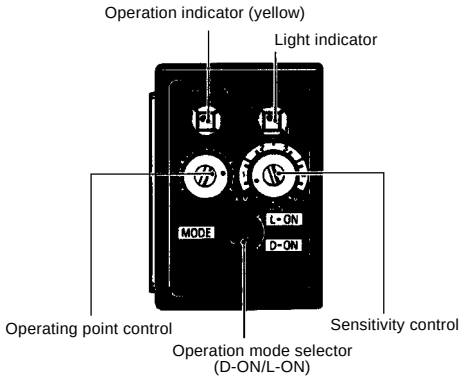
E39-R1 Reflector supplied with each
E3SA-RS50C43A Retroreflective Sensor





Operation

■ NOMENCLATURE



■ ADJUSTMENTS

For Through-Beam and Retroreflective Sensors

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 Sensors

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 of 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.

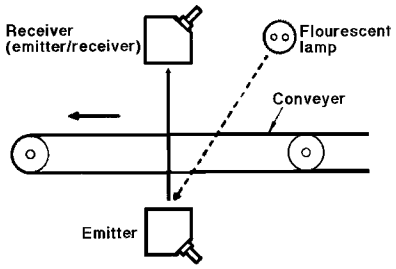
To ensure proper adjustment for best sensitivity, be certain that the current has not become saturated above the 20 mA maximum limit. This makes normal detection impossible because the deviation of output at saturation becomes too small for differentiation.

■ INFLUENCE OF FLUORESCENT LIGHTING

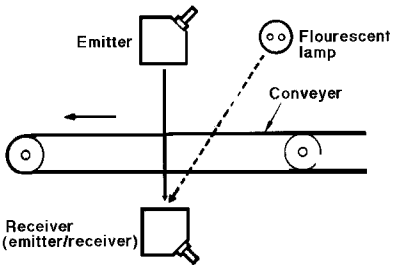
Do not allow direct exposure of fluorescent light on the receiver (through-beam types) or emitter/receiver (reflective types). This may have adverse affects on the analog output current.

When mounting the sensor, keep the angle formed between the light of the fluorescent 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 effects 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.

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