Sensing			Supply voltage	Output
30 m	3 m	70 cm, 2 m	10 to 30 VDC	100 mA

General–Purpose Photoelectric Sensor

E3S-C

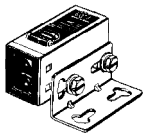
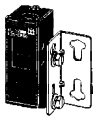
Rugged Metal Body DC Sensor with Long Sensing Distance

- Sensing distance up to six times as long as Omron's conventional photoelectric sensors
- NPN/PNP switch selectable output
- Fuzzy logic-enhanced mutual interference protection
- M12 plug-in connector
- Meets IP67 and NEMA 4X, 6P
- Vibration resistance of 10 Hz to 2 kHz and a shock resistance of 1,000 m/s^2 (approx. 100 G)

ISO 9001 Approved
OMRON Corporation, Ayabe Factory, Sensing Components and Systems

Ordering Information

■ SENSORS

Mounting	Method of detection	Sensing distance	Part Number	
			Prewired	**Connector**
Horizontal 	Through-beam	30 m (98.43 ft)	**E3S-CT11**	**E3S-CT16**
	Polarized retroreflective	3 m (9.84 ft)	**E3S-CR11**	**E3S-CR16**
	Diffuse reflective	70 cm (27.56 in)	**E3S-CD11**	**E3S-CD16**
		2 m (6.56 ft)	**E3S-CD12**	**E3S-CD17**
Vertical 	Through-beam	30 m (98.43 ft)	**E3S-CT61**	**E3S-CT66**
	Polarized retroreflective	3 m (9.84 ft)	**E3S-CR61**	**E3S-CR66**
	Diffuse reflective	70 cm (27.56 in)	**E3S-CD61**	**E3S-CD66**
		2 m (6.56 ft)	**E3S-CD62**	**E3S-CD67**

■ ACCESSORIES

Description		Part Number
Slits for E3S–CT□□sensors (4 pairs: 0.5 mm, 1.0 mm, 2 mm, and 4 mm wide, includes mounting hardware)		**E39-S61**
Vertical mounting bracket converts E3S–C series to the same optical axis as E3S-□□□□42 or E3S-□□□□44		**E39-L85**
Vertical mounting bracket converts E3S–C series to the same optical axis as E3S-□□□□43		**E39-L86**
Special E3S-C mounting bracket		**E39-L87**
Corner cube reflectors	0 to 4 m (0 to 13.12 ft) sensing distance	**E39-R2**
	0 to 150 cm (0 to 4.92 ft) sensing distance	**E39-R3**
	0 to 75 cm (0 to 2.46 ft) sensing distance	**E39-R4**
Adhesive back reflectors	5 to 35 cm (1.97 to 13.78 in) sensing distance	**E39-RSA**
	5 to 60 cm (1.97 to 23.62 in) sensing distance	**E39-RSB**
Mounting bracket for E39-R1 reflector		**E39-L7**

■ REPLACEMENT PARTS

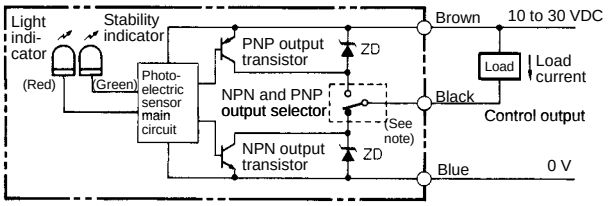
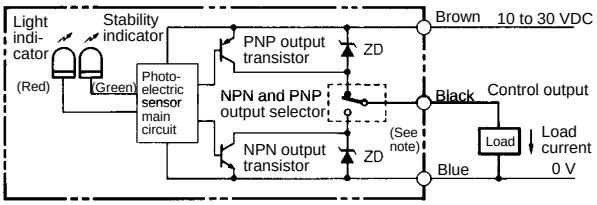
Description	Part Number
Mounting bracket for E3S−C□1□ (horizontal)	**E39-L102**
Mounting bracket for E3S−C□6□ (vertical)	**E39-L103**
Reflector (supplied with retroreflective sensors)	**E39-R1**

Specifications

Part number		E3S-CT11 E3S-CT61 E3S-CT16 E3S-CT66	E3S-CR11 E3S-CR61 E3S-CR16 E3S-CR66	E3S-CD11 E3S-CD61 E3S-CD16 E3S-CD66	E3S-CD12 E3S-CD62 E3S-CD17 E3S-CD67
Method of detection		Through-beam	Polarized retroreflective	Diffuse reflective	
Supply voltage		10 to 30 VDC, ±10%			
Current consumption		50 mA max. (emitter and receiver)	40 mA max.		
Sensing distance	White mat paper	0 to 30 m (0 to 98.43 ft)	0 to 3 m (0 to 9.84 ft)	0 to 70 cm (0 to 27.56 in)	0 to 2 m (0 to 6.56 ft)
	With accessories	4-mm slit: 15m 2-mm slit: 7m 1-mm slit: 3.5m 0.5-mm slit: 1.8m	E39-R2: 0 to 4m E39-R3: 0 to 150 cm E39-R4: 0 to 75 cm E39-RSA: 5 to 35 cm E39-RSB: 5 to 60 cm	___	
	Minimum object size	4-mm slit: 2.6-mm dia. 2-mm slit: 2-mm dia. 1-mm slit: 1-mm dia. 0.5-mm slit: 0.5-mm dia.	E39-R1 Reflector: 13-mm dia. E39-R3: 8-mm dia. E39-R4: 4-mm dia.	___	
Light source		Pulse modulated infrared LED (880 nm)	Pulse modulated red LED (700 nm)	Pulse modulated infrared LED (880 nm)	
Standard object	Type	Opaque materials	Opaque materials	Opaque and transparent materials	
	Size	9 mm (3.54 in) min.	30 mm (1.18 in) min.	30 x 30 cm (11.81 x 11.81 in) (white mat paper)	
Operation mode		Light-ON/Dark-ON operation, switch selectable			
Variation in sensing distance		−		±10% max.	
Hysteresis		−		20% max. of sensing distance	
Variation in optical axis and mounting direction		±2° max.			
Sensitivity		Adjustable, 3/4 turn knob		Adjustable, 2-1/2 turn knob with clutch and indicator	
Mutual interference protection		Not provided	Provided		
Control output	Type	NPN or PNP (selectable), open collector current output			
	Max. load	100 mA max.			
	Residual voltage	NPN output: 1.2 V max., PNP output: 2.0 V max.			
Response time	OFF	1 ms max.			2 ms max.
	ON	1 ms max.			2 ms max.
Circuit Protection		Output short-circuit protection, reversed polarity protection			
Vibration resistance	Destruction	10 to 2 kHz, 1.5-mm double amplitude, or 300 m/s^2 (approx. 30G) 0.5 hrs each in X, Y, and Z directions			
Shock resistance	Destruction	1,000 m/s^2 (approx. 100G) 3 times each in X, Y, and Z directions			

Part number		E3S-CT11 E3S-CT61 E3S-CT16 E3S-CT66	E3S-CR11 E3S-CR61 E3S-CR16 E3S-CR66	E3S-CD11 E3S-CD61 E3S-CD16 E3S-CD66	E3S-CD12 E3S-CD62 E3S-CD17 E3S-CD67
Indicators	Emitter	Power ON (red)	Stability indicator (green), Light Incident (red)		
	Receiver	Stability indicator (green), Light Incident (red)			
Materials	Lens	Acrylic			
	Case	Zinc die-cast			
	Operation panel	Sulfonated polyether			
	Bracket	Stainless steel			
Mounting		Either side surface with two threaded holes. Bracket for horizontal (E39-L102) or vertical (E39-L103) sensors and hardware included.			
Connections	Emitters	2-conductor cable, 2m (6.56 ft) length	3-conductor cable, 2m (6.56 ft) length (for prewired types)		
	Receiver	3-conductor cable, 2m (6.56 ft) length			
Weight	Horizontal model	110 g (3.88 oz.)			
	Vertical model	115 g (4.06 oz.)			
Enclosure ratings	IEC 144	IP67			
	NEMA	1, 4X, 6P, 12, 13			
Ambient temperature	Operating	-25°C to 55°C (-13°F to 131°F)			
	Storage	-40°C to 70°C (-40°F to 158°F)			

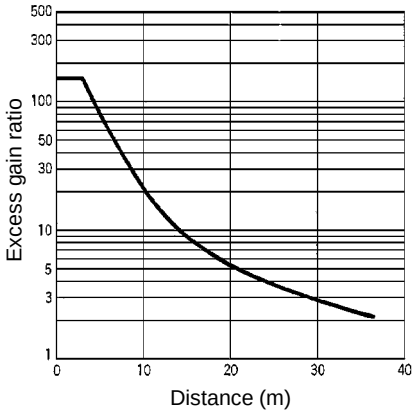
■ OUTPUT CIRCUIT DIAGRAMS

Output configuration	Mode switch	Output transistor	Output circuits
NPN	Light-ON	ON when light is received.	
	Dark-ON	ON when light is not received.	
			ZD : V_Z = 39 V Note: Set the NPN and PNP output selector to NPN.
PNP	Light-ON	ON when light is received.	
	Dark-ON	ON when light is not received.	
			ZD : V_Z = 39 V Note: Set the NPN and PNP output selector to PNP.

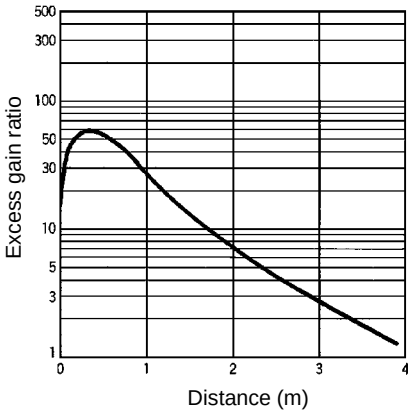
Engineering Data

■ EXCESS GAIN RATIO

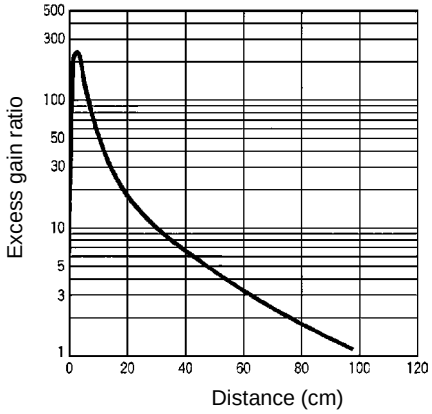
E3S-CT□6



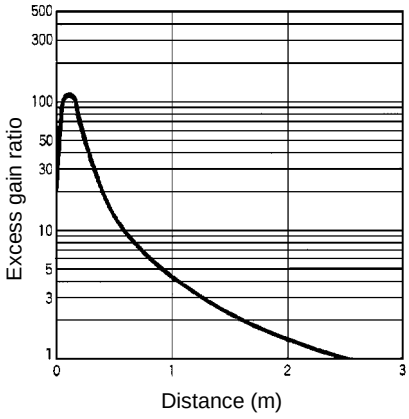
E3S-CR□6 (E39-R1 Reflector)



E3S-CD□6



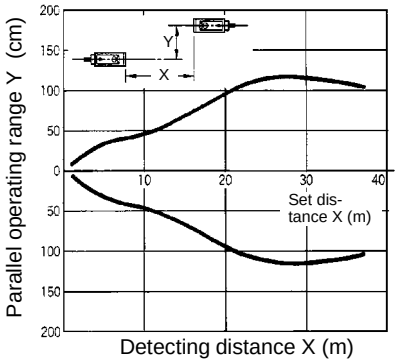
E3S-CD□7



■ OPERATING RANGE

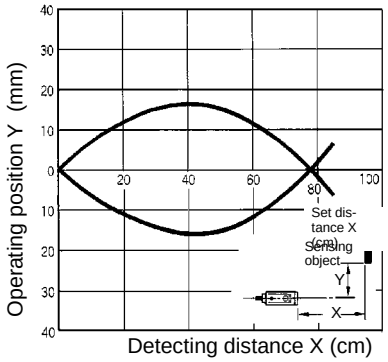
Parallel Operating Range (Typical)

E3S-CT□6

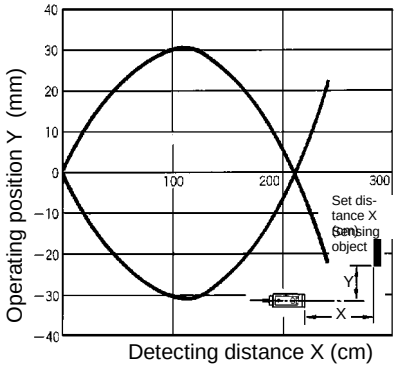


Operating Range (Typical)

E3S-CD□6 (Left and Right)

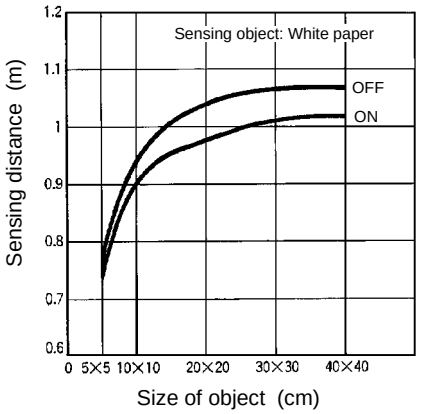


E3S-CD□7 (Left and Right)

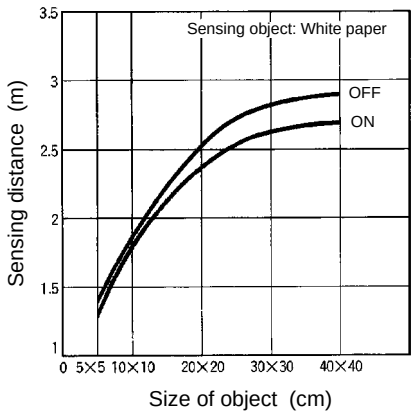


Sensing Distance vs. Object Size (Typical)

E3S-CD□6

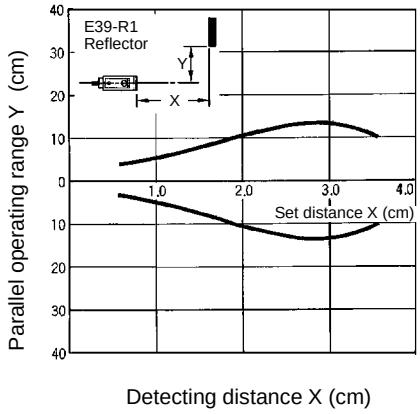


E3S-CD□7

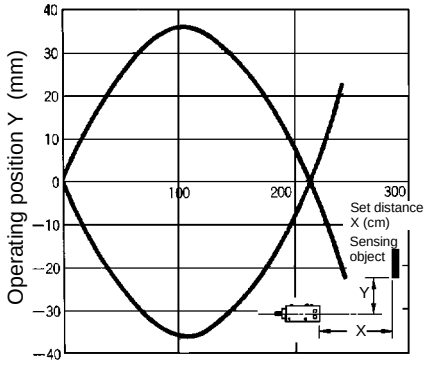


Reflector Parallel Movement (Typical)

E3S-CR□6



E3S-CD□7 (Up and Down)

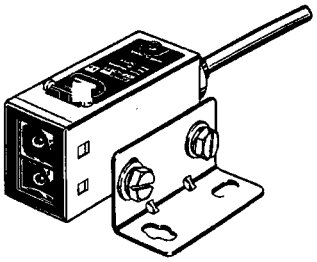


Dimensions

Unit: mm (inch)

■ SENSORS

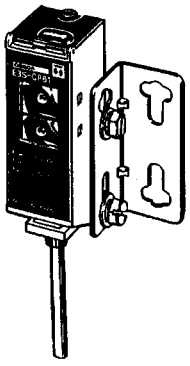
E3S-CT11, E3S-CR11
E3S-CD11, E3S-CD12



* The mounting bracket can be attached to side A.

** For E3S-CT11, optical viewing for the emitter and the receiver are from the top portion of the sensor.

E3S-CT61, E3S-CR61
E3S-CD61, E3S-CD62

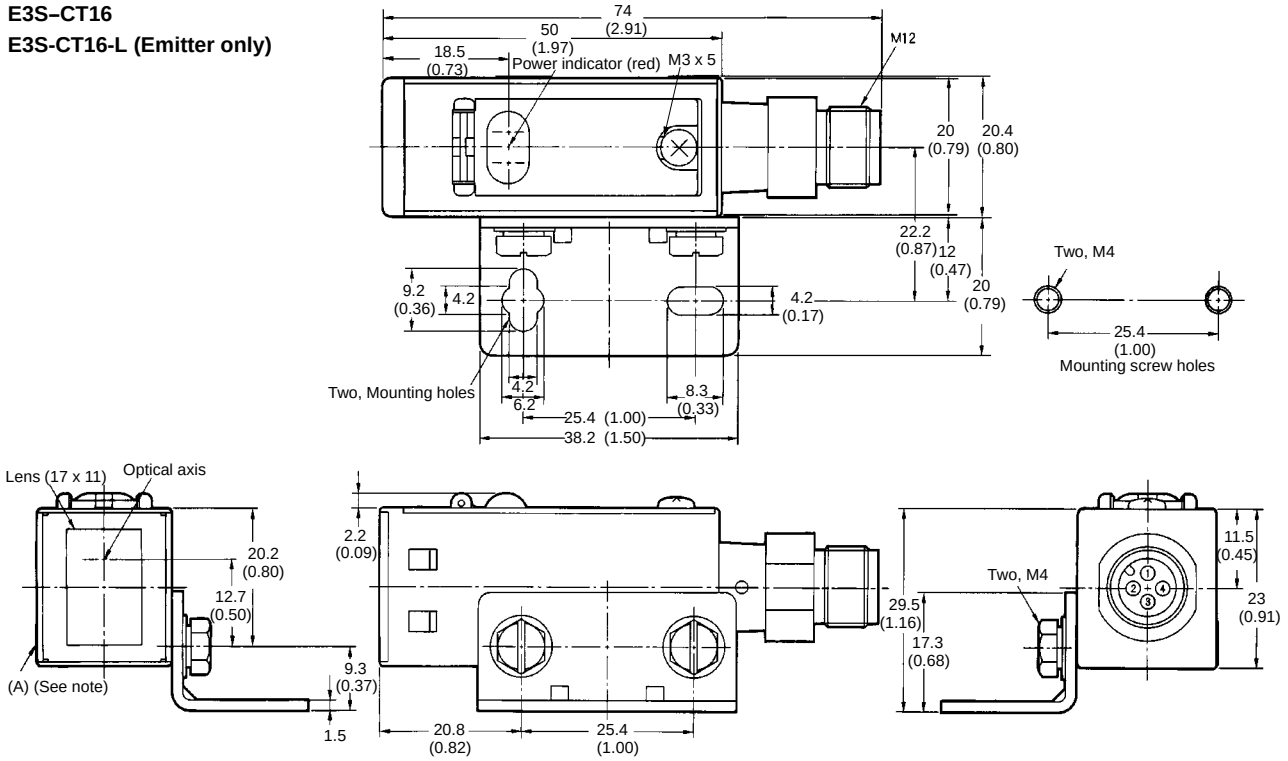


* The mounting bracket can be attached to side A.

** For E3S-CT61, optical viewing for the emitter and the receiver are from the top portion of the sensor.

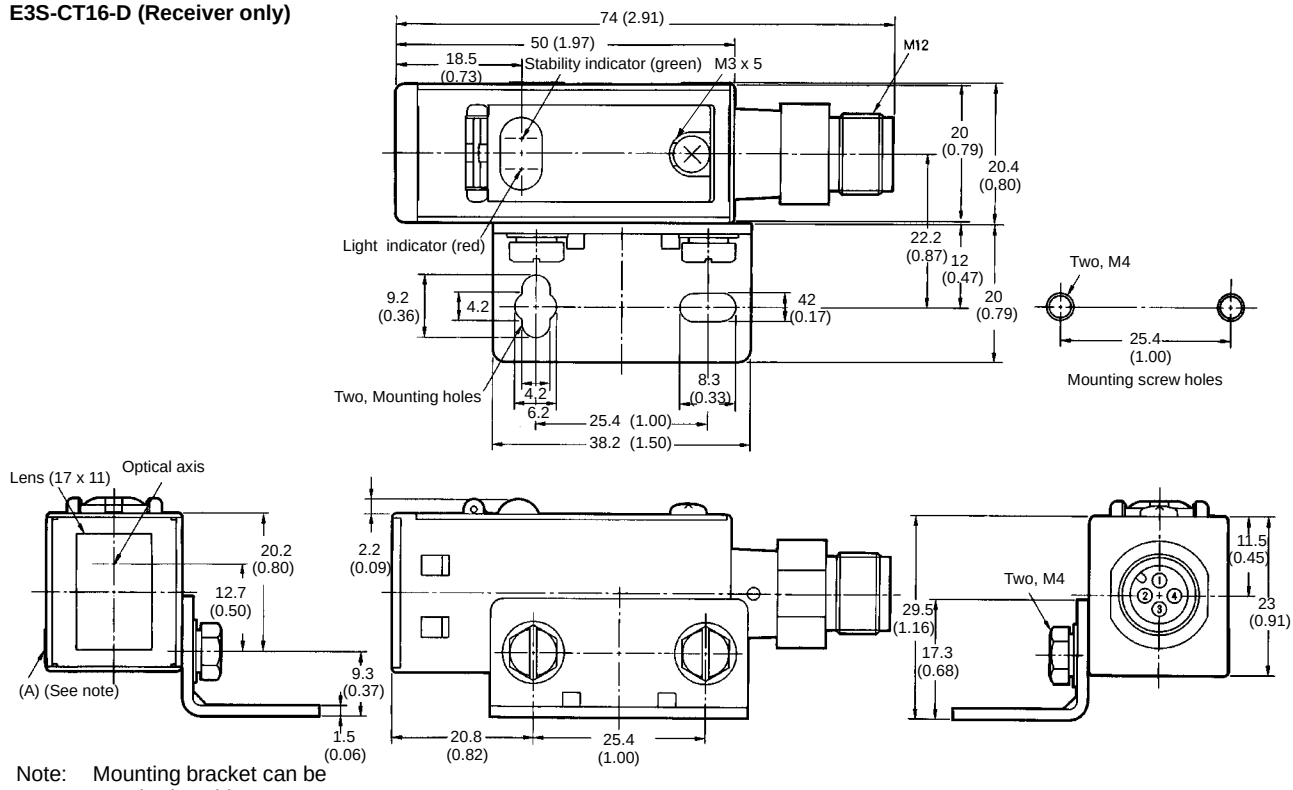
E3S–CT16

E3S-CT16-L (Emitter only)



Note: Mounting bracket can be attached to side A.

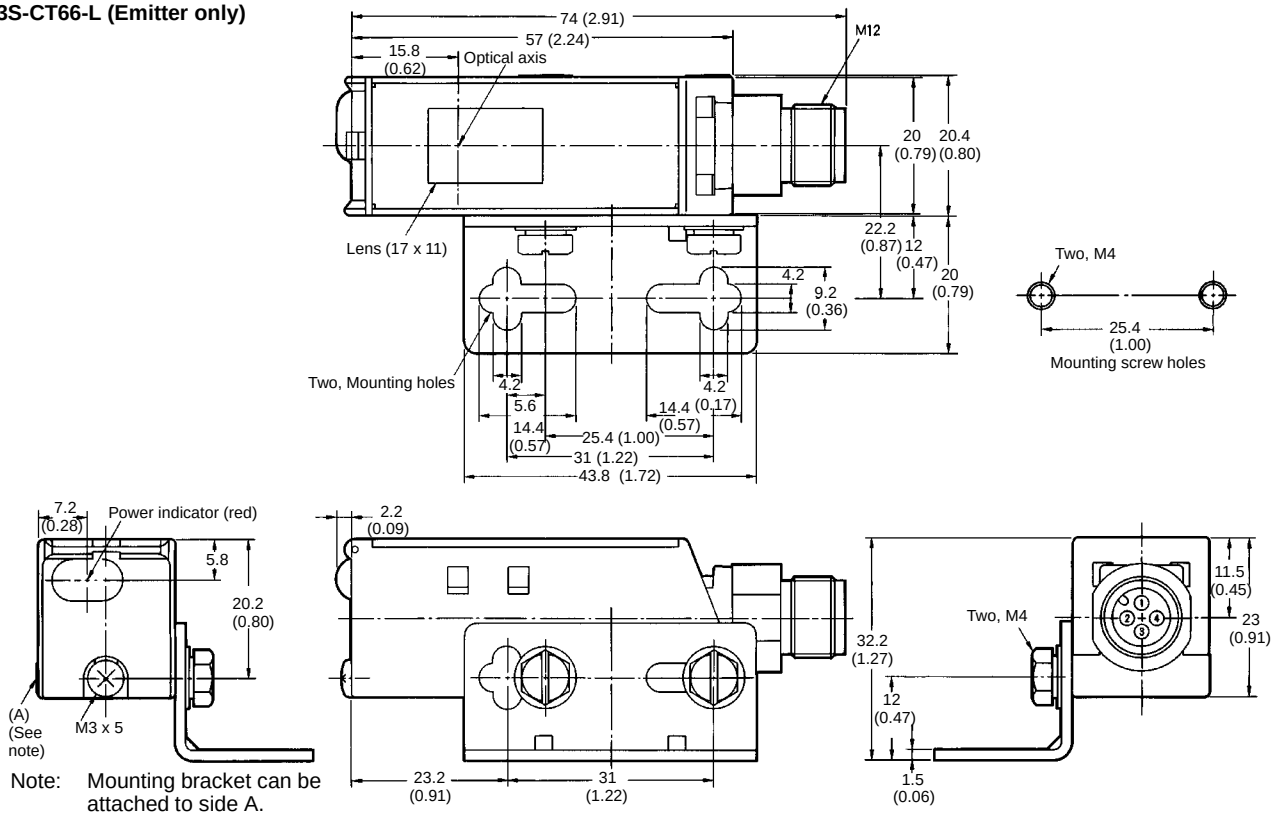
E3S-CT16-D (Receiver only)



Note: Mounting bracket can be attached to side A.

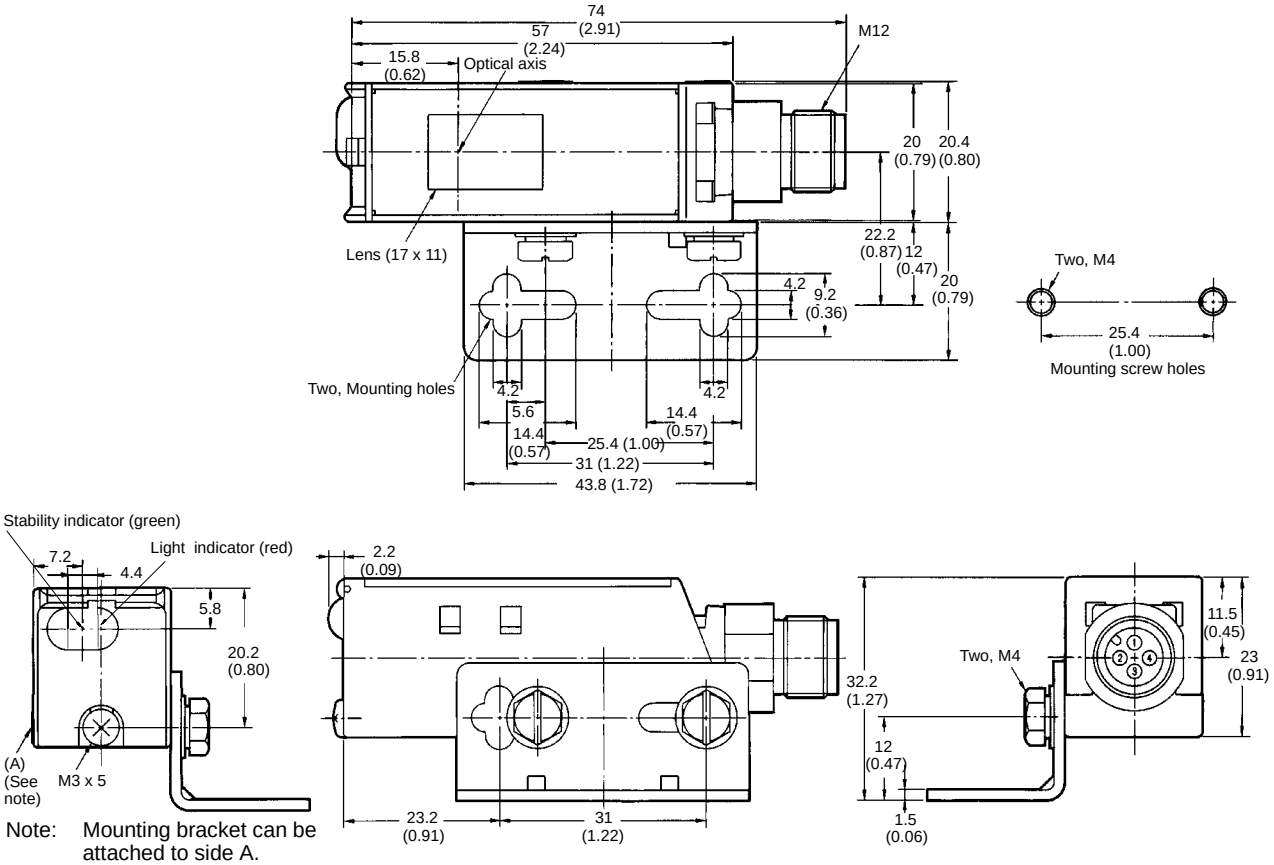
E3S–CT66

E3S-CT66-L (Emitter only)



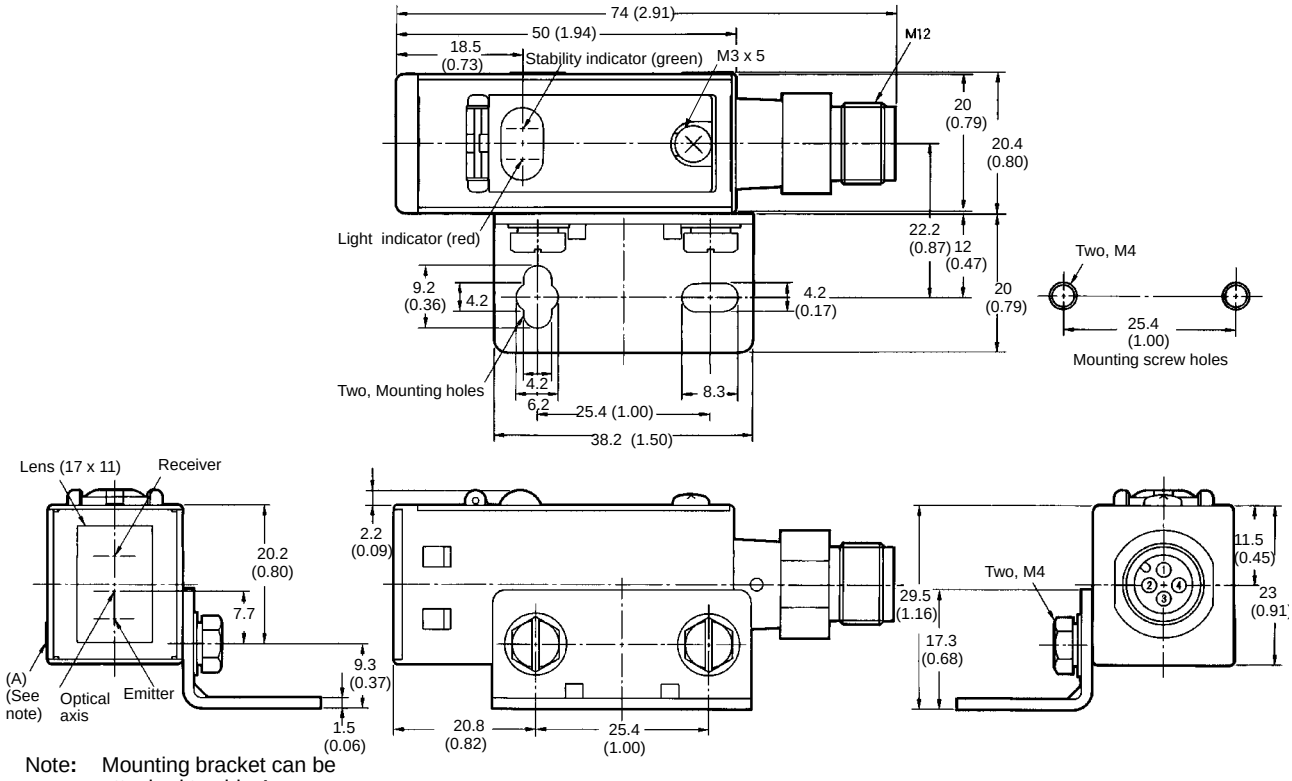
Note: Mounting bracket can be attached to side A.

E3S-CT66-D (Receiver only)



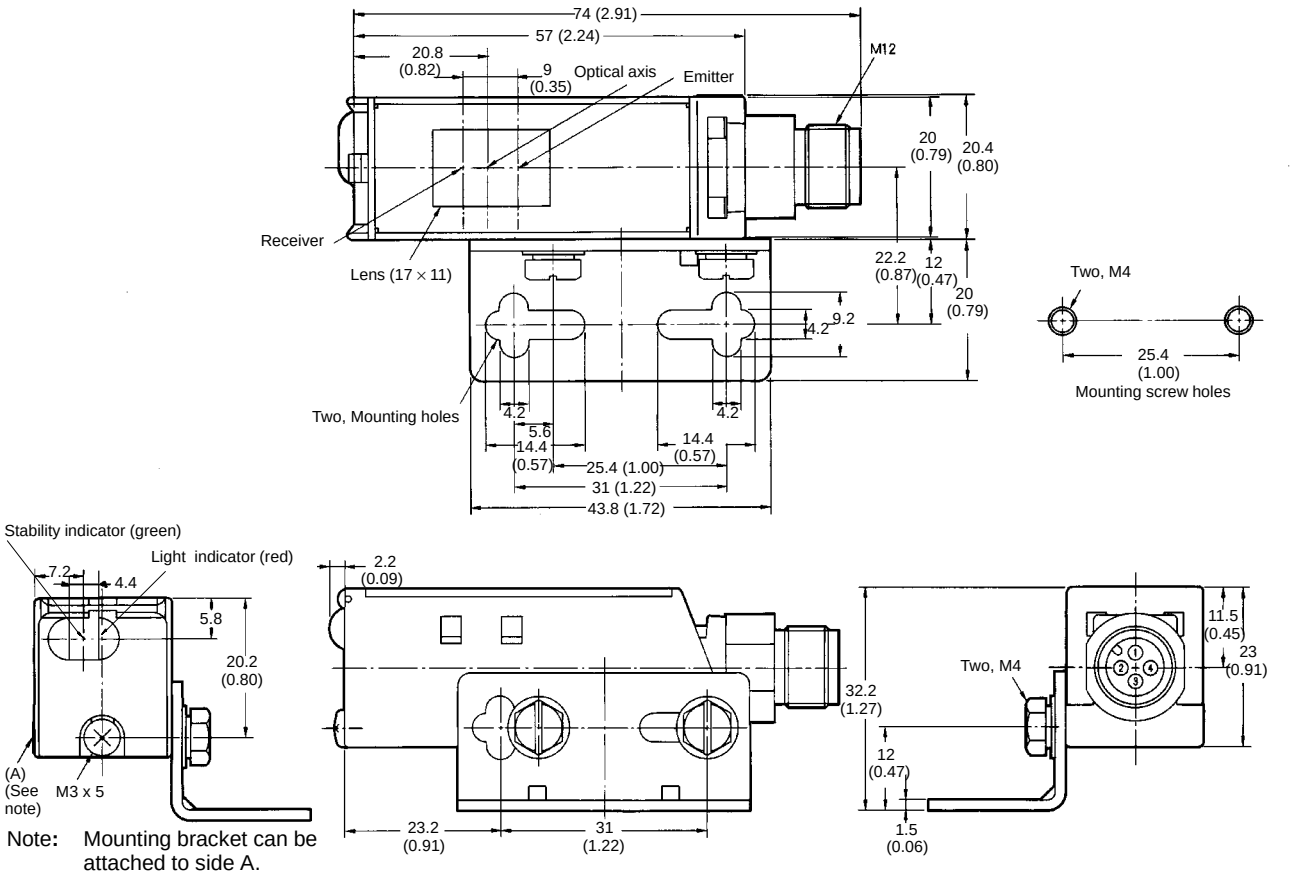
Note: Mounting bracket can be attached to side A.

E3S-CR16/-CD16/-CD17



Note: Mounting bracket can be attached to side A.

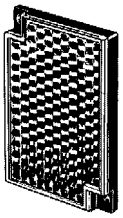
E3S-CR66/-CD66/-CD67

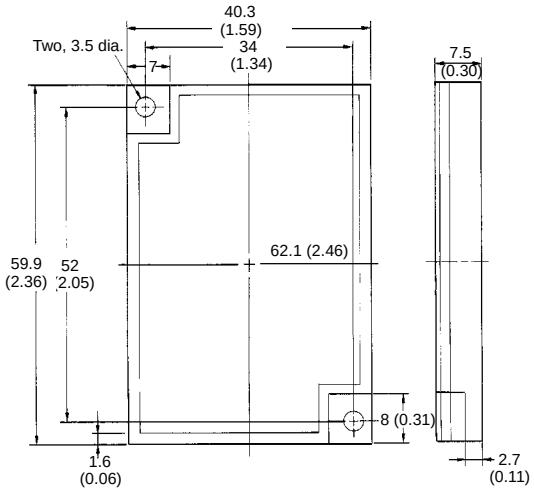


Note: Mounting bracket can be attached to side A.

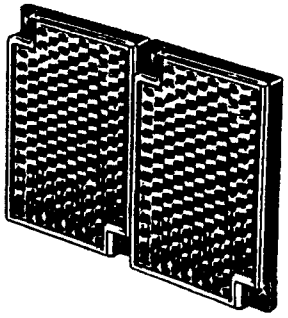
■ CUBE REFLECTORS

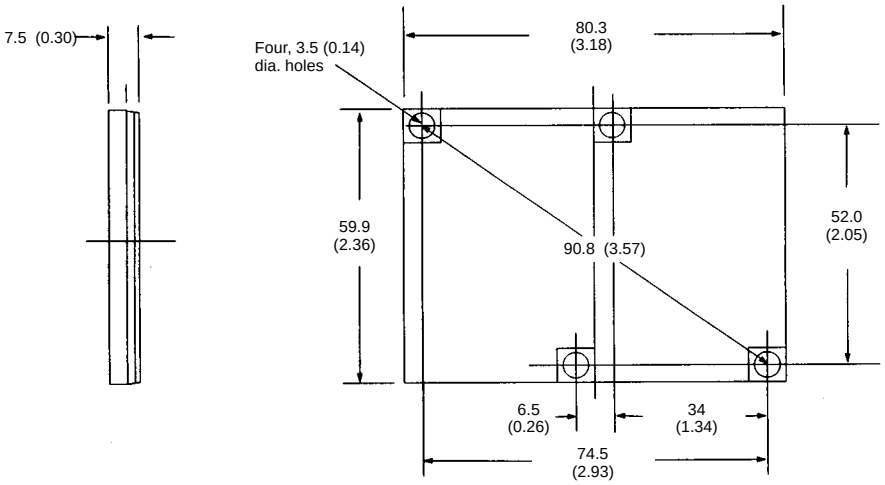
E39-R1 Retroreflector
(Included with the E3S-CR11/CR61)



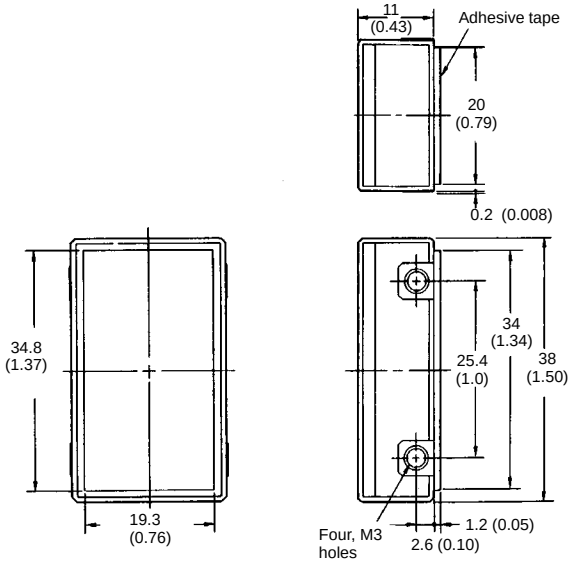


E39-R2 Optional Reflector

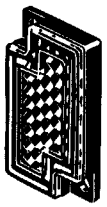


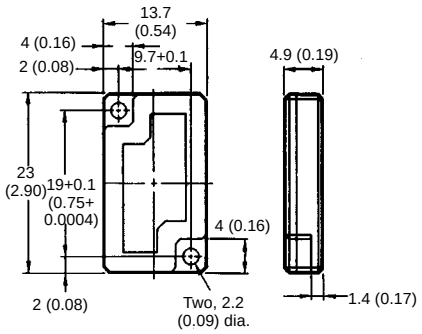


E39-R3 Option Small Reflector with (Mounting Bracket)

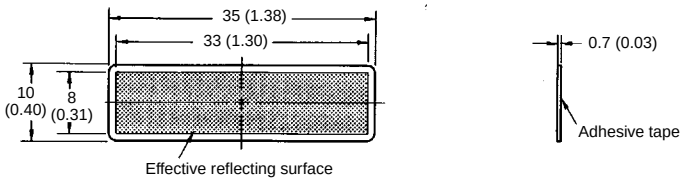


E39-R4 Optional Mini-Reflector

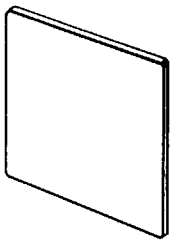


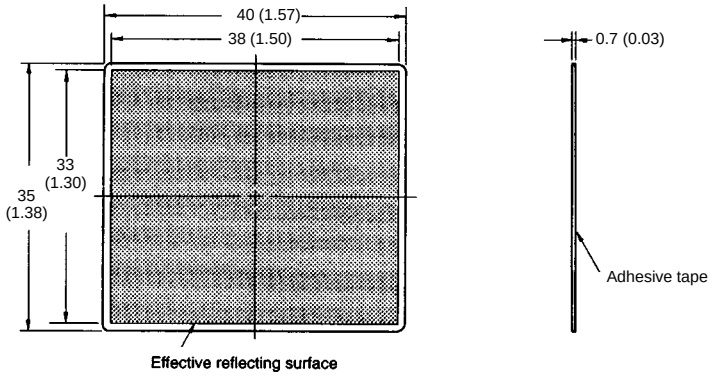


E39-RSA Optional Adhesive-Backed Reflector

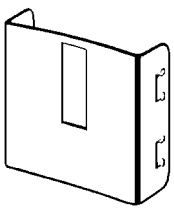


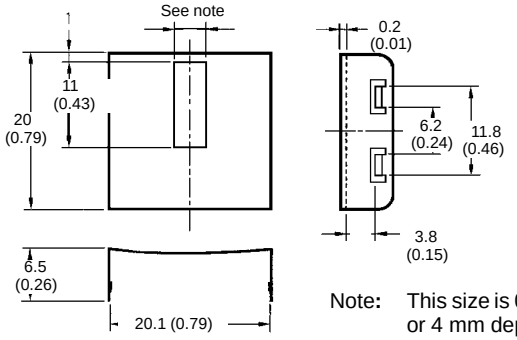
E39-RSB Optional Adhesive-Backed Reflector





E39-S61 Slit Kit for E3S-C



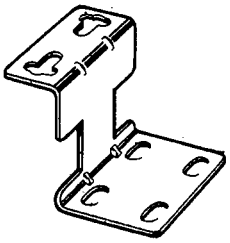


Note: This size is 0.5 mm, 1 mm, 2 mm, or 4 mm depending on the type.

■ MOUNTING BRACKETS

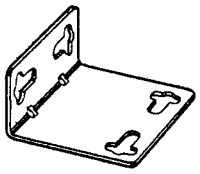
E39-L85 Vertical Mounting Bracket

Converts E3S-C Sensors to have the same optical axis as E3S-□□□□42/44.

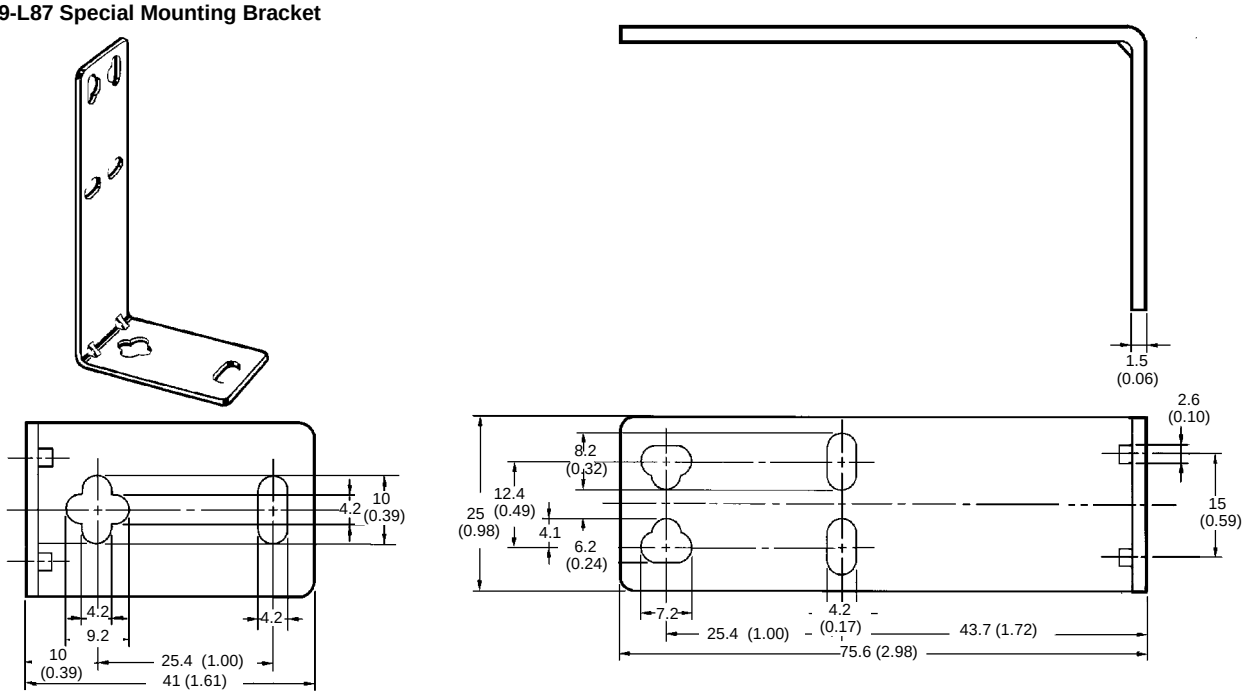


E39-L86 Vertical Mounting Bracket

Converts E3S-C Sensors to have the same optical axis as E3S-□□□□43.



E39-L87 Special Mounting Bracket

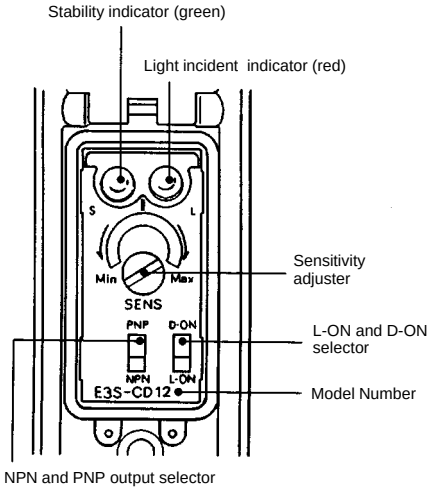


Nomenclature

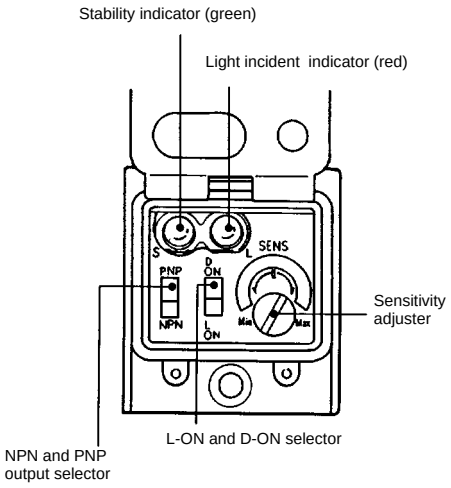
■ OPERATION PANEL

Use the NPN and PNP output selector on the operation panel to select the type of output transistor.
Use the Light-ON and Dark-ON selector on the operation panel to select the operation mode of the E3S-C.

Horizontal Model



Vertical Model



Operation

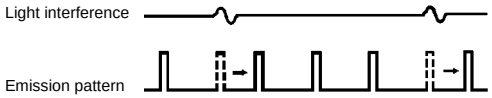
■ FUZZY LOGIC MUTUAL INTERFERENCE PREVENTION FUNCTION

(FOR E3S-CR□□ AND E3S-CD□□ ONLY)

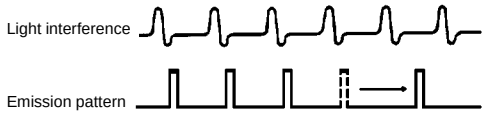
If photoelectric sensors are installed side by side, each Sensor may be influenced (or malfunction) by the light emitted from the other sensors. This is known as mutual interference.

The fuzzy logic mutual interference prevention function of the E3S-C enables the E3S-C to monitor light interference over a certain period of time. Before the E3S-C starts emitting light, the E3S-C retrieves the intensity and frequency of surrounding light interference as data. Using this data, the E3S-C calculates, with fuzzy inference, the risk of the E3S-C malfunctioning and controls the timing of the E3S-C's light emission.

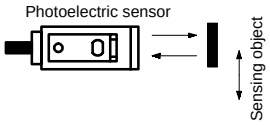
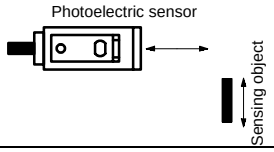
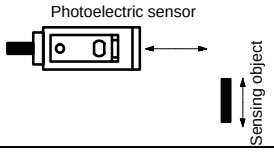
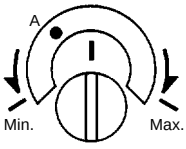
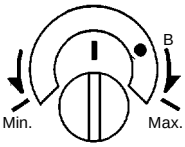
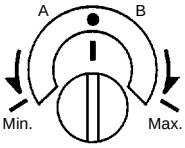
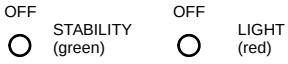
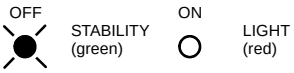
When the risk is low, the E3S-C waits until there is no light interference and emits light.



When the risk is high, the E3S-C emits light between each light interference moment.



■ SENSITIVITY ADJUSTMENT (REFLECTIVE SENSORS)

Steps	Step 1	Step 2	Step 3
Function	Determine position A	Determine position B	Adjust to optimum setting
Sensing condition			
Sensitivity adjustor			
Indicators			
Procedure	Place target at the desired sensing distance. Set sensitivity adjuster to the minimum scale position, and gradually increase sensitivity by turning the sensitivity adjuster clockwise until the Light Incident indicator (red LED) turns ON. Position A designates the point at which the LED has turned on.	Remove the target. Starting from the maximum scale position, gradually decrease sensitivity by turning the sensitivity adjuster counterclockwise until the Light Incident indicator (red LED) turns OFF. Position B designates the point at which the LED has turned OFF.	Set the sensitivity indicator to the position between Positions A and B (in some cases, Positions A and B are opposite of the above example). The photoelectric sensor will then work normally if the stability indicator (green) is lit with and without the target. If it is not lit, stable operation cannot be guaranteed,in which case a different detection method should be applied.

Unlike conventional photoelectric sensors, the variation in the sensitivity among several E3S-C photoelectric sensors is minimal. This means the sensitivity can be adjusted on only a single photoelectric sensor, and then the adjusters on the other E3S-C photoelectric sensors can be set to the same scale position. There should be no need to adjust the sensitivity of each photoelectric sensor individually.

Precautions

■ CONNECTION

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

The cord connected to the E3S-C can be extended up to 100 m provided that the diameter of each wire of the cord is 0.3 mm^2 minimum.

■ POWER SUPPLY

If the standard switching regulator is used as a power supply, the frame ground (FG) terminal and the ground (G) terminal, on the power supply, must be grounded. If this is not done the E3S-C may malfunction, due to the switching noise of the power supply.

■ WATER RESISTANCE

To ensure the water resistance of the E3S-C, tighten the screws of the operation panel cover to a torque of 3.5 to 5.5 kgf • cm (0.34 N • m to 0.54 N • m).

■ MALFUNCTIONING

If an inverter motor or servomotor is used with the E3S-C, the frame ground (FG) terminal and the ground (G) terminal, on the motor, must be grounded, otherwise the E3S-C may malfunction.

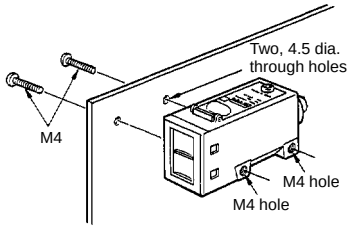
Installation

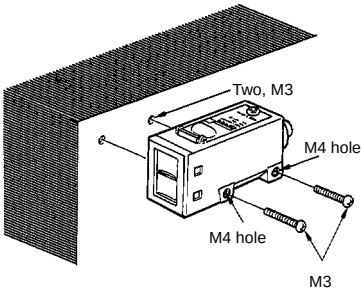
■ MOUNTING

Use M4 screws to mount the E3S-C. The tightening torque of each screw must be 12 kgf • m (1.18 N • m) maximum.

■ DIRECT MOUNTING

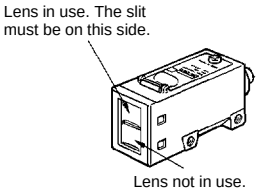
Mount the E3S-C as shown in the following illustrations.





■ OPTICAL AXIS OF THROUGH-BEAM SENSOR

The E3S-C through-beam models incorporate two lenses, one of which will be used as shown in the following illustration. When using a slit, the slit must be on the side where the lens is located.



NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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Cat. No. CEDSAX2 3/97 Specifications subject to change without notice. Printed in U.S.A.