



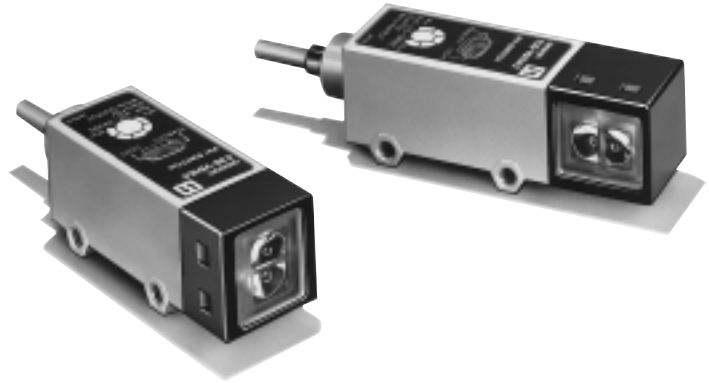
Sensing  1.2 cm, 5 cm	Supply voltage 12 to 24 VDC	Output  80 mA, 24 VDC with 1.5 to 4 mA constant current source; 100 mA, 24 VDC
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# Color Mark Photoelectric Sensor

# E3S-VS

## Small Color Mark Sensor With Built-In DC Amplifier

- Fast, 1 ms maximum response time ideal for parts and package identification
- Accurately detects colored marks against many different backgrounds by amount of contrast
- Choose PNP or NPN output models
- Light-on/dark-on operation, wire selectable
- Vertical and horizontal mounting styles
- Ready-to-use: prewired with 2 m (6.56 ft) cable; includes mounting bracket



## Ordering Information

### ■ SENSORS

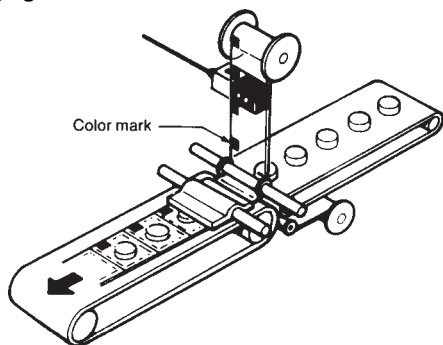
Method of detection		Diffuse reflective		
Sensing distance		1.2 ±0.2 cm (0.47 ±0.08 in)		5 ±0.3 cm (1.97 ±0.12 in)
Light source		Green LED		Red LED
Mounting style		Horizontal 	Vertical 	Vertical 
Part number	NPN output	E3S-VS1E4	E3S-VS1E42	E3S-VS5E42R
	PNP output	E3S-VS1B4	E3S-VS1B42	E3S-VS5B42R

### ■ REPLACEMENT PARTS

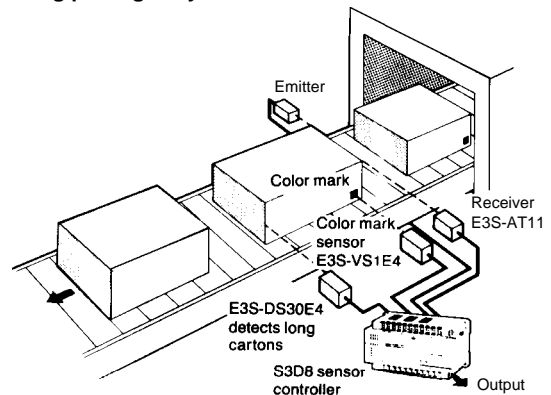
Description	Part number
Mounting bracket (supplied with each sensor)	E39-L6
Sensitivity adjuster knob (supplied with each sensor)	E39-G1

### ■ TYPICAL APPLICATIONS

Detecting marks on sealing material on a blister-pack packaging line



Sorting packages by color mark and size

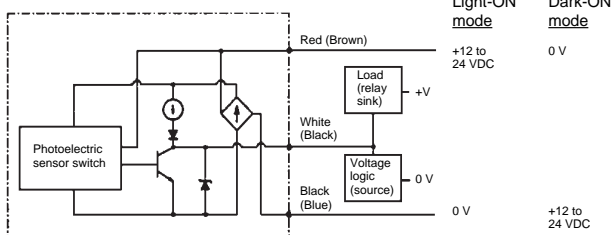


# Specifications

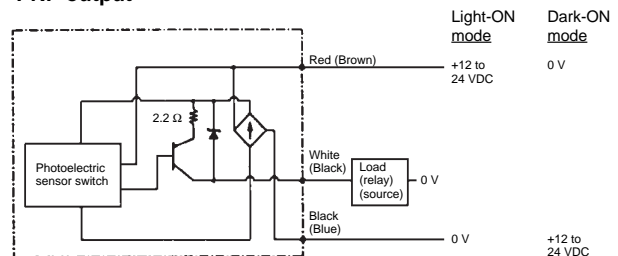
Part number	E3S-VS1□4□		E3S-VS5□42R
Method of detection	Diffuse reflective		
Supply voltage	12 to 24 VDC		
Current consumption	40 mA max.		
Sensing distance	1.2 ±0.2 (0.47 ±0.08 in) with 2 x 2 mm (0.08 x 0.08 in) black mark on white background	5 ±0.3 cm (1.97 ±0.12 in) with 3 x 3 mm (0.12 x 0.12 in) black mark on white background	
Light source	Pulse modulated green LED (560 nm)	Pulse modulated infrared LED (680nm)	
Detectable object type	Color marks on colored background (see Color Combination Chart)		
Operation mode	Light-ON/Dark-ON, wire selectable		
Sensitivity	Adjustable		
Mutual interference protection	Provided		
Control output	DC solid-state	Type	NPN-SPST open collector with constant current source (E3S-VS□E4□□) PNP-SPST open collector (E3S-VS□B4□□)
		Max. load	NPN type: Load (relay, sink) logic: 80 mA Voltage (source) logic: 1.5 to 3 mA PNP type: Load (relay, source) logic: 100 mA
		Max. on-state voltage drop	1 VDC
Response time	On	1 ms max.	
	Off	1 ms max.	
Circuit protection	Output short-circuit	Provided	
	DC power supply reverse polarity	Provided	
Indicators	Light Incident (red LED), Output Stability (green LED)		
Materials	Lens	Plastic	
	Case	Diecast zinc	
	Cable sheath	Plastic	
Mounting	Side mounting with two through holes; Bracket E39-L2 and hardware included		
Connections	Prewired	3-conductor cable, 2 m (6.56 ft) length	
Weight	160 g (5.64 oz.)		
Enclosure ratings	UL	—	
	NEMA	1, 4, 4X, 12 13	
	IEC 144	IP67	
Approvals	UL	—	
	CSA	—	
Ambient temperature	Operating	-25° to 55°C (-13° to 131°F)	

## OUTPUT CIRCUIT DIAGRAMS

### NPN output



### PNP output



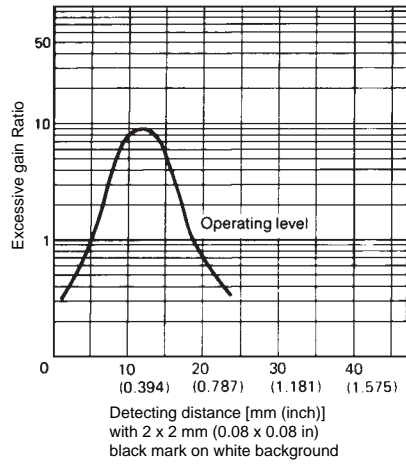
IEC colors are shown in parentheses.

- Notes:
1. When the Black wire from the separate type emitter is connected to the Black wire of the separate type receiver, the LED indicator on the emitter will indicate Light Incident on the receiver.
  2. When the Black wire from the separate type emitter is connected to the Blue or Brown wire of the emitter, the LED indicator on the emitter indicates Power On.

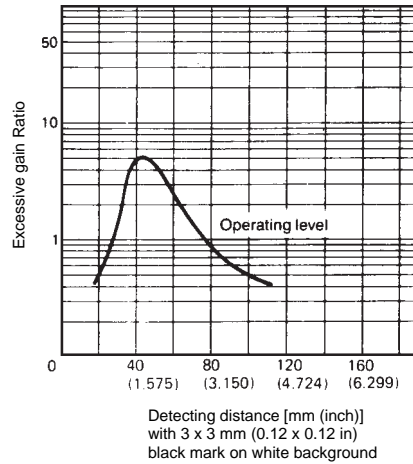
# Engineering Data

## ■ EXCESS GAIN RATIO

E3S-VS1E4(2), E3S-VS1B4(2)

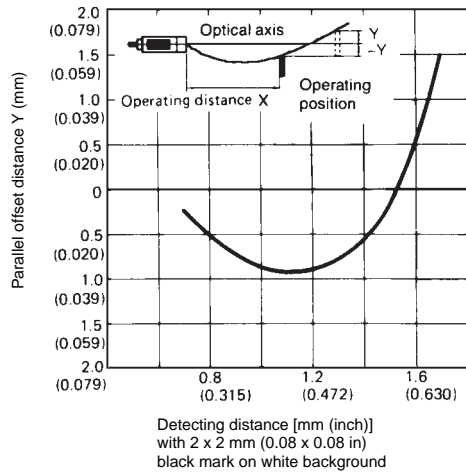


E3S-VS5E42R, E3S-VSB42R

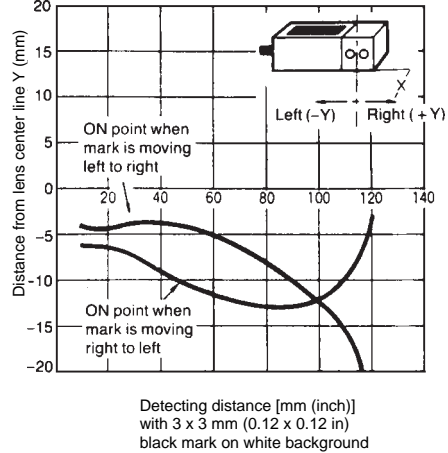


## ■ OPERATING RANGE

E3S-VS1E4(2), E3S-VS1B4(2)



E3S-VS5E42R, E3S-VSB42R

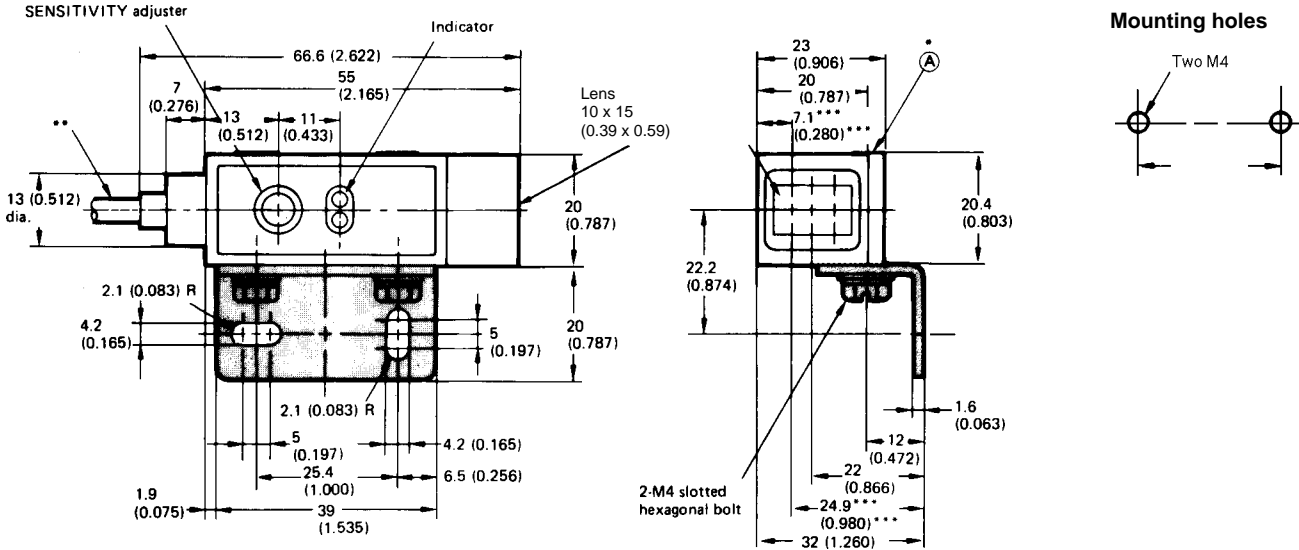


# Dimensions

Unit: mm (inch)

## ■ HORIZONTAL MOUNTING TYPES

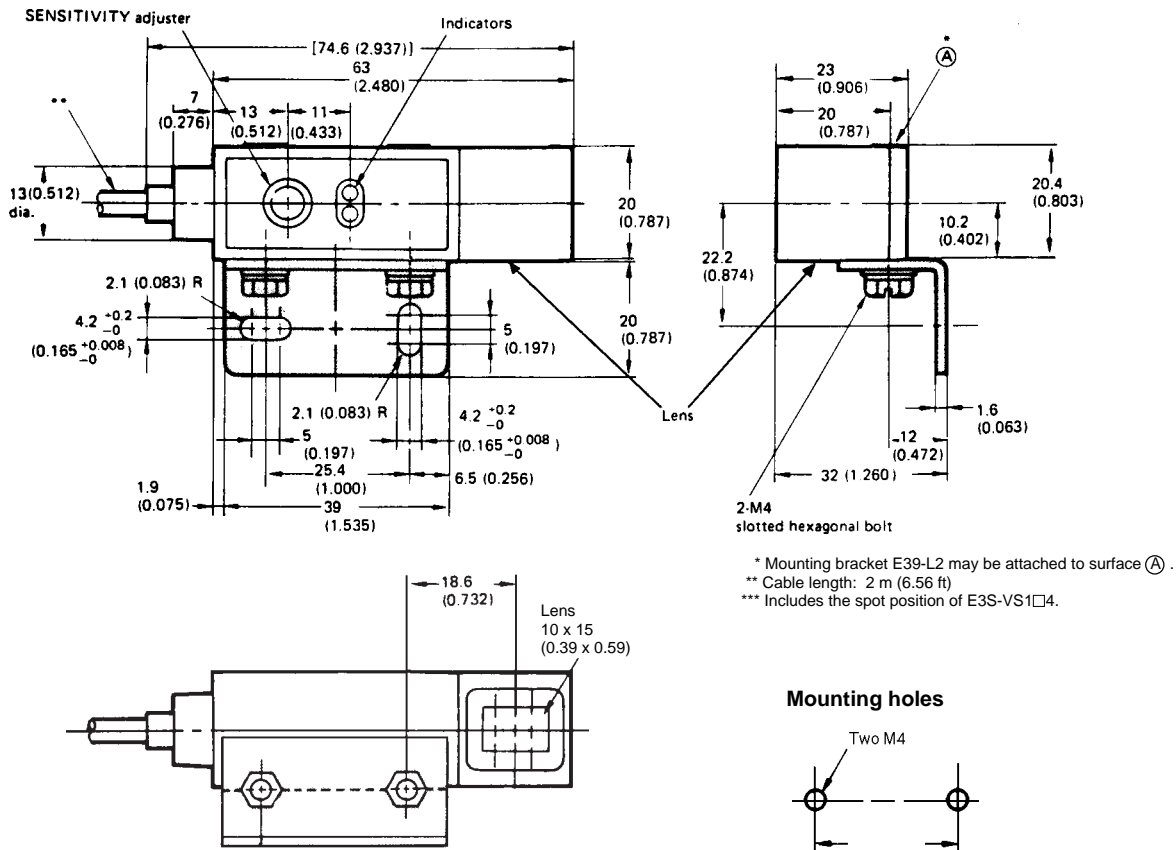
### E3S-VS1□4



\* Mounting bracket E39-L2 may be attached to surface (A).  
 \*\* Cable length: 2 m (6.56 ft)  
 \*\*\* Includes the spot position of E3S-VS1□4.

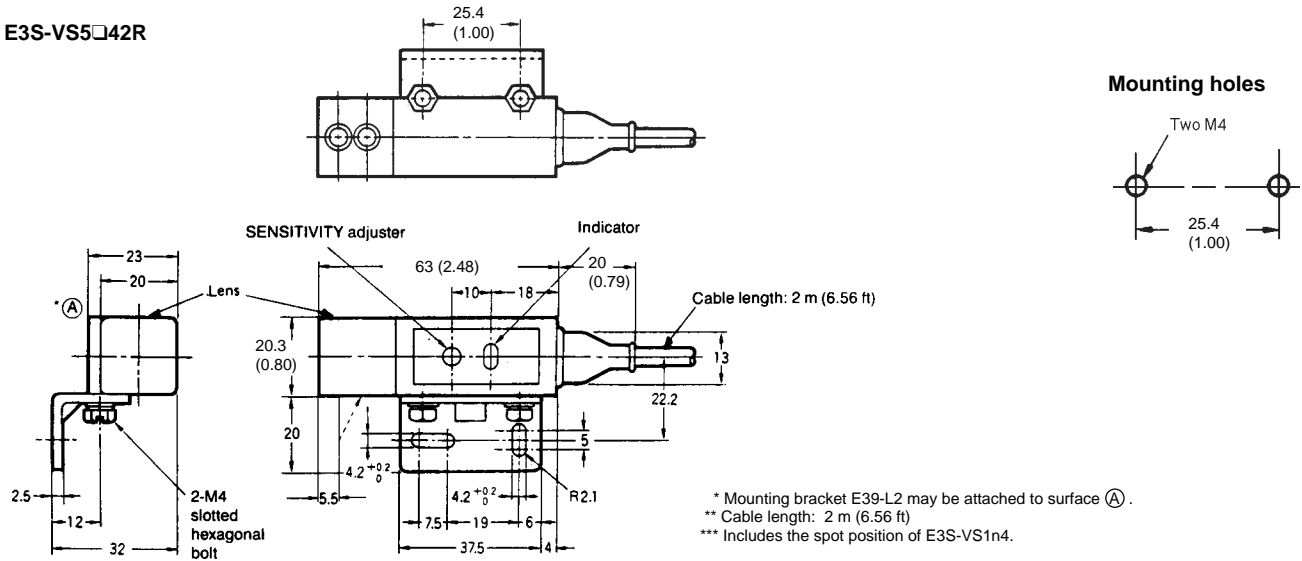
## ■ VERTICAL MOUNTING TYPES

### E3S-VS1□42

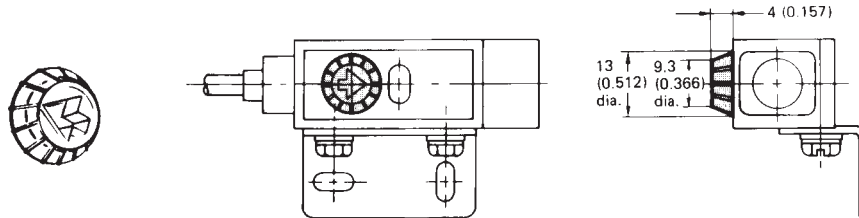


\* Mounting bracket E39-L2 may be attached to surface (A).  
 \*\* Cable length: 2 m (6.56 ft)  
 \*\*\* Includes the spot position of E3S-VS1□4.

E3S-VS5□42R



■ SENSITIVITY ADJUSTER KNOB E39-G1 (included)



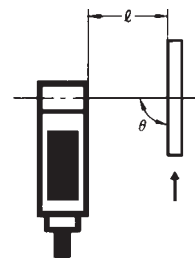
Operation

■ SELECTING THE PROPER SENSOR FOR COLOR MARK DETECTION

The charts identify the combinations of color marks and color backgrounds that can be detected. Refer to the illustration for other test parameters used in preparing these sample values.

Legend: ○: Sensor detects the mark stably.  
 X: Sensor will not detect the mark.  
 —: Not applicable.

Note: 1. These charts are only for reference. Testing should be done to confirm operation.



Green light source (E3S-VS1n4n):  $l = 35$  mm,  $\theta = 90^\circ$

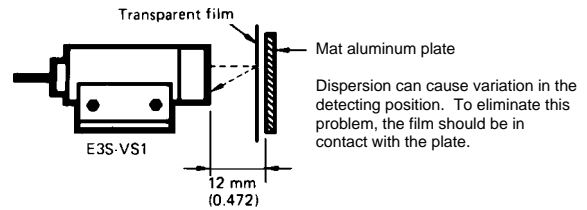
Background color	Color of mark to be detected								
	Black	Silver	Red	Orange	Yellow	Green	Blue	Purple	White
Black	—	○	○	○	○	X	X	X	○
Silver	○	—	○	○	X	○	○	○	X
Red	○	○	—	X	○	○	○	X	○
Orange	○	○	X	—	○	○	○	X	○
Yellow	○	X	○	○	—	○	○	○	X
Green	X	○	○	○	○	—	X	X	○
Blue	X	○	○	○	○	X	—	X	○
Purple	X	○	X	X	○	X	X	—	○
White	○	X	○	○	X	○	○	○	—

Red light source (E3S-VS5n42R);  $\varnothing = 50 \text{ mm}$ ,  $\theta = 100^\circ$  to  $105^\circ$

Background color	Color of mark to be detected									
	Black	Silver	Red	Orange	Yellow	Green	Blue	Indigo-blue	Purple	White
Black	—	○	○	○ ○		X	X	X	○	○
Silver	○	—	X	X	X	○	○ ○		X	X
Red	○	X	—	X	X	○	○ ○		X	X
Orange	○	X	X	—	X	○	○ ○		X	X
Yellow	○	X	X	X	—	○	○ ○		X	X
Green	X	○	○	○ ○		—	X	X	○	○
Blue	X	○	○	○ ○		X	—	X	○	○
Indigo-blue	X	○	○	○ ○		X	X	—	○	○
Purple	○	X	X	X	X	○	○ ○		—	○
White	○	X	X	X	X	○	○ ○	○		—

**DETECTING MARKS ON FILM**

To detect marks on a transparent sheet (such as film), an object with a high reflection factor must be placed behind the sheet as shown in the figure at right. A mat aluminum plate is recommended.



**NOTE: DIMENSIONS ARE IN MILLIMETERS; THOSE IN PARENTHESES ARE IN INCHES.**



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