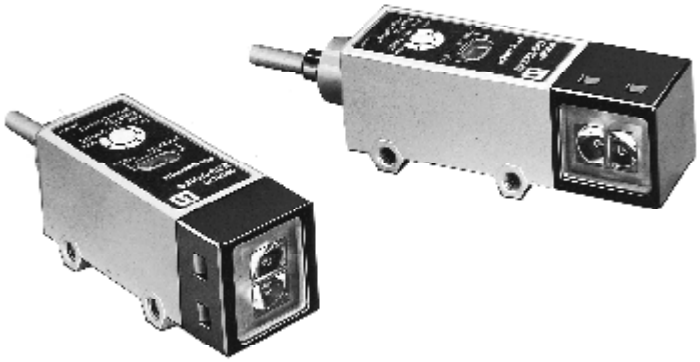
OMRON

Color Mark Sensor with Red or Green LED **E3S-VS**

Rugged IP67 Color Mark Sensor

- 1 ms response time
- Detects a wide variety of color marks
- PNP or NPN output models
- Light-on/ Dark-on operation, wire selectable
- Vertical and horizontal mounting styles



Ordering Information

■ SENSORS

Sensing distance		12 mm			35 mm	50 mm
Light source		Green LED				Red LED
Mounting style		Horizontal 	Vertical 		Vertical 	
Part number	NPN w/ pull-up resistor	**E3S-VS1E4** (See Note 1.)	**E3S-VS1E42**	**—**	**E3S-VS5E42G**	**E3S-VS5E42R**
	PNP open collector	**E3S-VS1B4**	**E3S-VS1B42**	**E3S-VS1B43**	**—**	**E3S-VS5B42R**
	NPN open collector	**E3S-VS1C4**	**E3S-VS1C42**	**—**	**—**	**—**

Note: 1. For H12 connector version of E3S-VS1E4 with 0.5 m cable, order E3S-VS1E4-P1J 0.5M

■ REPLACEMENT PARTS

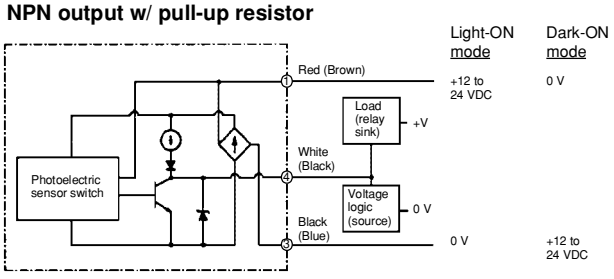
Description	Part number
Mounting bracket for horizontal models (supplied with each sensor)	**E39-L2**
Mounting bracket for vertical models (supplied with each sensor)	**E39-L6**
Sensitivity adjuster knob (supplied with each sensor)	**E39-G1**

Specifications

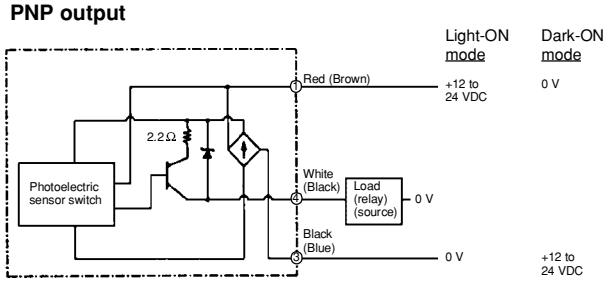
Part number			E3S-VS1□4□	E3S-VS3E42G	E3S-VS5□42R
Method of detection			Diffuse reflective		
Supply voltage			12 to 24 VDC		
Current consumption			40 mA max.		
Sensing distance			12 mm with 2 x 2 mm (0.08 x 0.08 in) black mark on white background	35 mm with 2 x 2 mm black mark on white background	50 mm with 3 x 3 mm (0.12 x 0.12 in) black mark on white background
Light source			Pulse modulated green LED		Pulse modulated infrared LED
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 outputt	DC solid state	Type	NPN-SPST open collector with constant current source (E3S-VS□E4□□) NPN-SPST open collector (E3S-VS□C4□□) 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		NEMA	1, 4, 4X, 12 13		
		IEC 144	IP67		
Ambient temperature		Operating	-25° to 55°C (-13° to 131°F)		
		Storage	-40° to 70°C (-40° to 158°F)		

■ OUTPUT CIRCUIT DIAGRAMS

NPN output w/ pull-up resistor



PNP output



IEC colors are shown in parentheses.

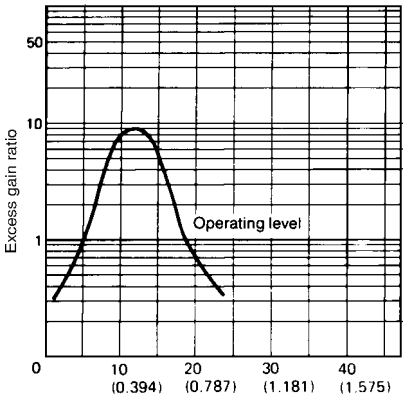
Note: 1. When the Black wire from the through-beam emitter is connected to the Black wire of the separate type receiver, the LED indicator on the emitter will indicate Light Incident on the receiver.

2. When the Black wire from the through-beam emitter is connected to the Blue or Brown wire of the emitter, the LED indicator on the emitter indicates Power On.

Engineering Data

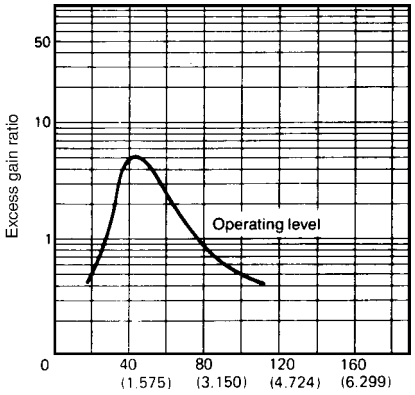
■ EXCESS GAIN RATIO

E3S-VS1E4(2), E3S-VS1B4(2)(3)



Detecting distance [mm (inch)]
with 2 x 2 mm (0.08 x 0.08 in)
black mark on white background

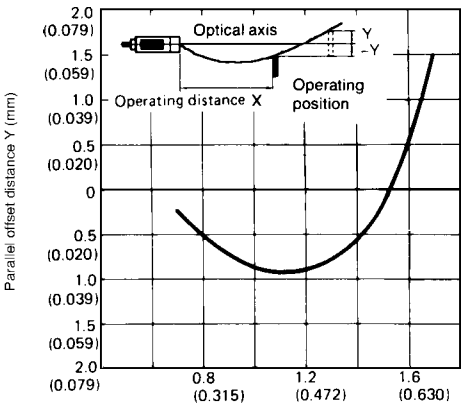
E3S-VS5E42R, E3S-VSB42R



Detecting distance [mm (inch)]
with 3 x 3 mm (0.12 x 0.12 in)
black mark on white background

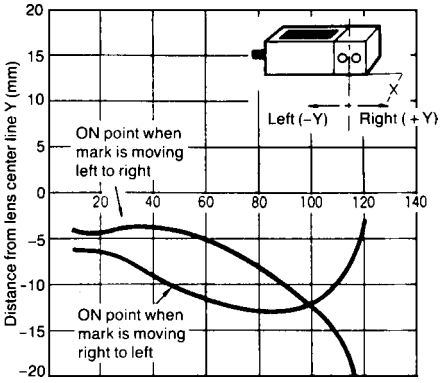
■ OPERATING RANGE

E3S-VS1E4(2), E3S-VS1B4(2)(3)



Detecting distance [mm (inch)]
with 2 x 2 mm (0.08 x 0.08 in)
black mark on white background

E3S-VS5E42R, E3S-VSB42R



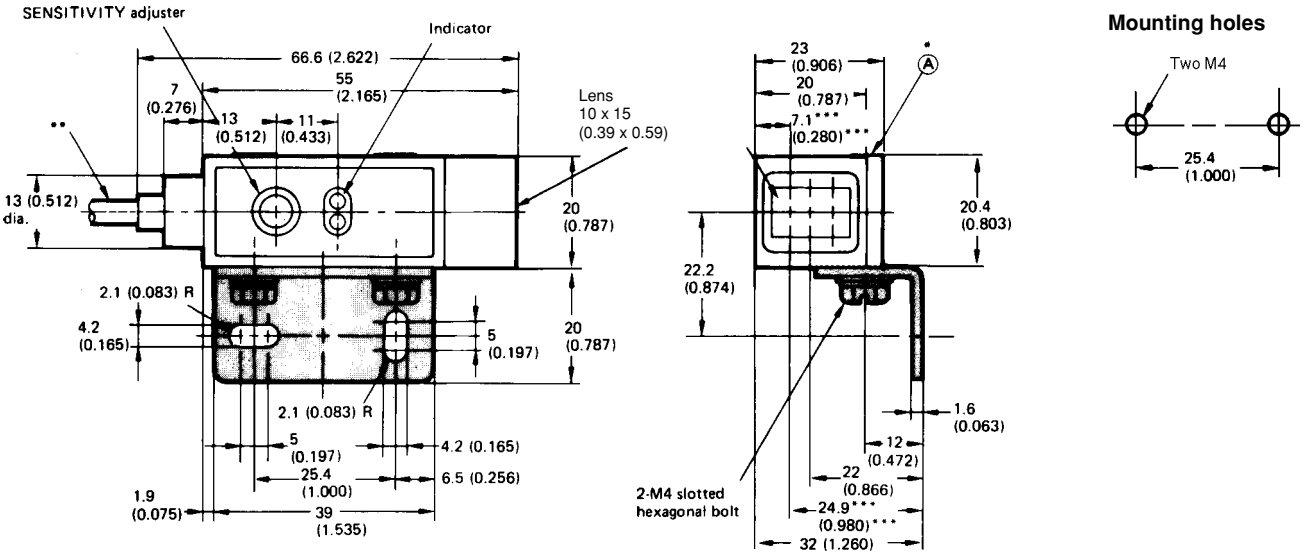
Detecting distance [mm (inch)]
with 3 x 3 mm (0.12 x 0.12 in)
black mark on white background

Dimensions

Unit: mm (inch)

■ HORIZONTAL MOUNTING TYPES

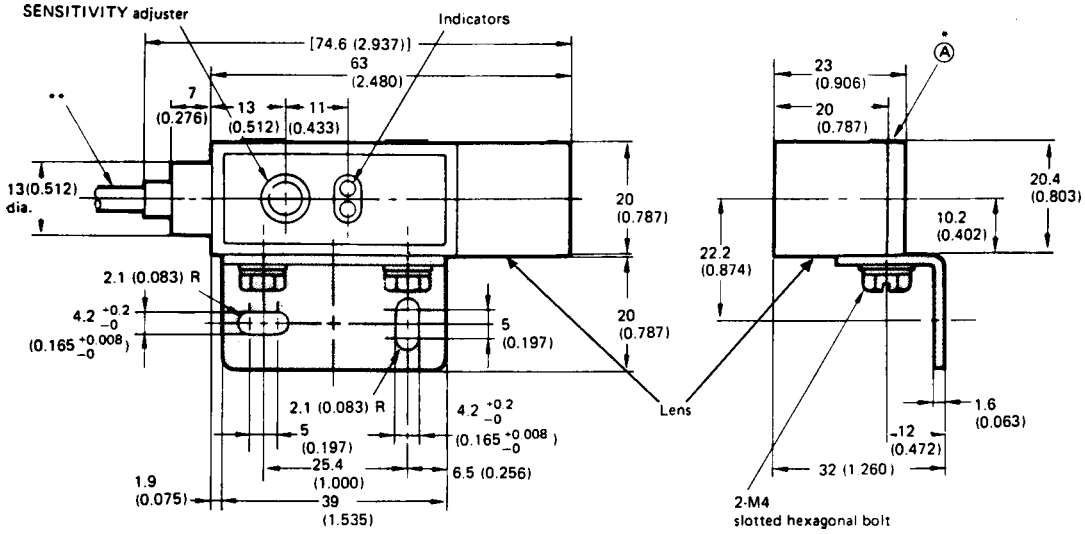
E3S-VS1□4



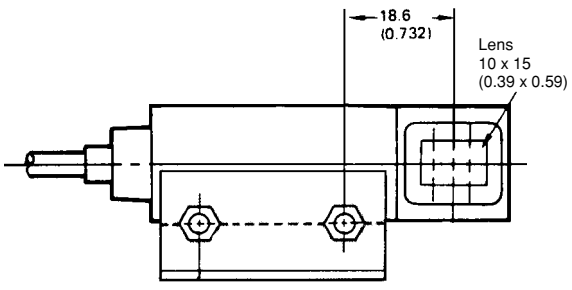
* Mounting bracket E39-L2 may be attached to surface Ⓐ.
** Cable length: 2 m (6.56 ft)
*** Includes the spot position of E3S-VS1□4.

■ VERTICAL MOUNTING TYPES

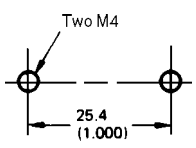
E3S-VS1□42



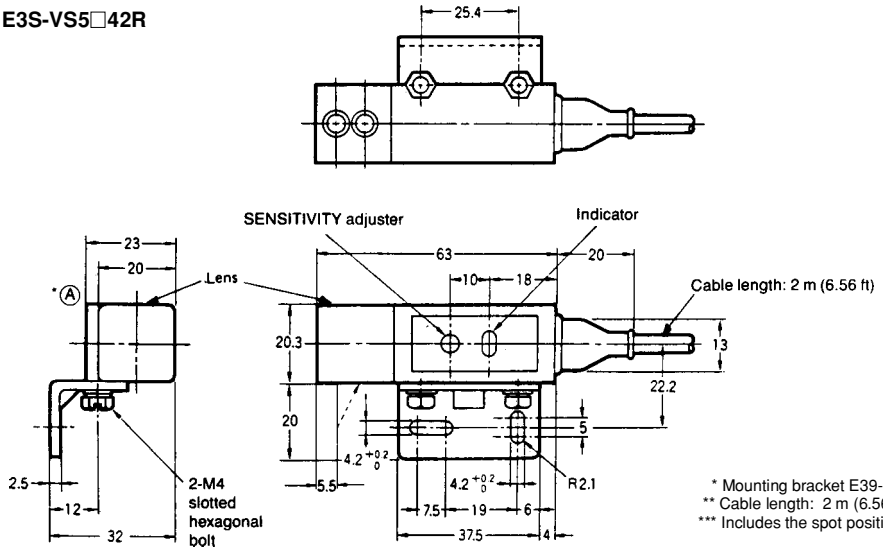
* Mounting bracket E39-L6 may be attached to surface Ⓐ.
** Cable length: 2 m (6.56 ft)
*** Includes the spot position of E3S-VS1□4.



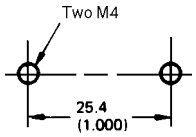
Mounting holes



E3S-VS5□42R

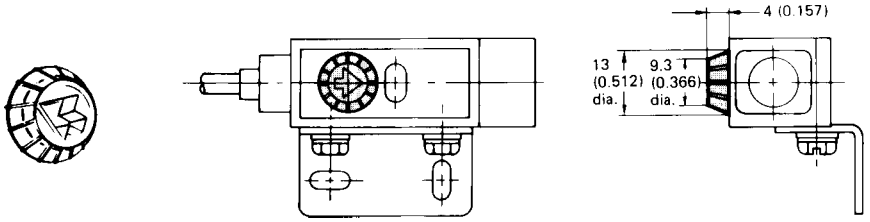


Mounting holes



* Mounting bracket E39-L6 may be attached to surface Ⓐ.
** Cable length: 2 m (6.56 ft)
*** Includes the spot position of E3S-VS1n4.

■ SENSITIVITY ADJUSTER KNOB E39-G1 (included)

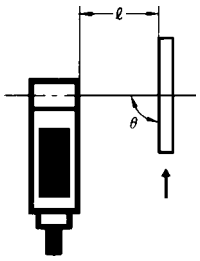


Operation

■ 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.



Green light source (E3S-VS1n4n): ℓ = 35 mm, θ = 90°

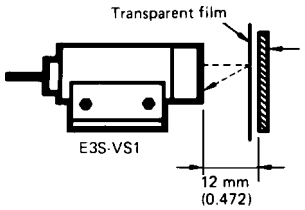
Background color	Color of mark to be detected								
	Black	Silver	Red	Orange	Yellow	Green	Blue	Purple	White
Black	—	❍	❍	❍	❍	X	X	X	❍
Silver	❍	—	❍	❍	X	❍	❍	❍	X
Red	❍	❍	—	X	❍	❍	❍	X	❍
Orange	❍	❍	X	—	❍	❍	❍	X	❍
Yellow	❍	X	❍	❍	—	❍	❍	❍	X
Green	X	❍	❍	❍	❍	—	X	X	❍
Blue	X	❍	❍	❍	❍	X	—	X	❍
Purple	X	❍	X	X	❍	X	X	—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

Red light source (E3S-VS5n42R); ℓ = 50 mm, θ =100° to 105°

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

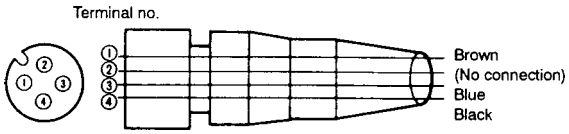
To detect marks on a transparent sheet (such as film), an object with a high reflection factor must be placed behind the sheet as shown in the figure at right. A mat aluminum plate is recommended.



Dispersion can cause variation in the detecting position. To eliminate this problem, the film should be in contact with the plate.

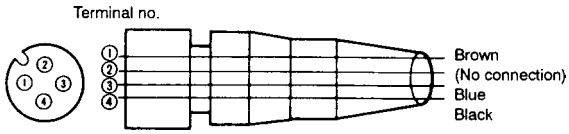
■ I/O CONNECTOR PLUG

NPN output



XS2F-D421-DC0-A
XS2F-D421-GC0-A

PNP output



XS2F-D421-DC0-A
XS2F-D421-G81-A

NPN or PNP output			
Type	Conductor	Connector Pin	Application
DC	Brown	1	Power supply (+V)
	Black	4	Output
	Blue	3	Power supply (0 V)
	—	2	No connection

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