OMRON

Background Suppression Sensor — E3S-LS

Focusable Sensors with Built-In DC Amplifiers

- Pinpoint focusable and area focusable models eliminate background objects
- Ideal for precise detection of level/height, edges, small holes and openings, objects touching one another, objects inside transparent covers
- Fast, 1 ms max. response time
- Light-on/dark-on operation wire selectable
- Choose NPN and PNP output models
- Ready-to-use: pre-leaded with 2 m (6.56 ft) cable and includes mounting bracket

Ordering Information

■ SENSORS

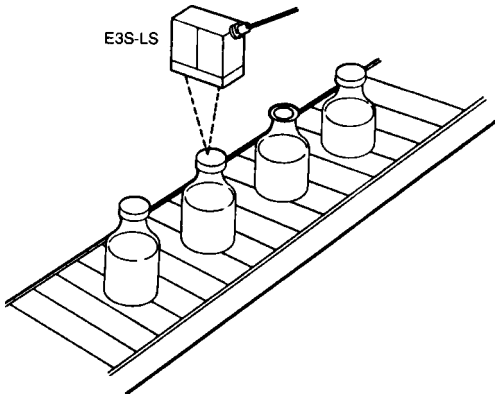
Method of detection		Pinpoint focusable diffuse reflective	Area focusable diffuse reflective
Sensing distance		3 to 10 cm (1.18 to 3.94 in)	5 to 25 cm (1.97 to 9.84 in)
Part number	NPN output	**E3S-LS10XE4**	**E3S-LS20XE4**
	PNP output	**E3S-LS10XB4**	**E3S-LS20XB4**

■ REPLACEMENT PARTS

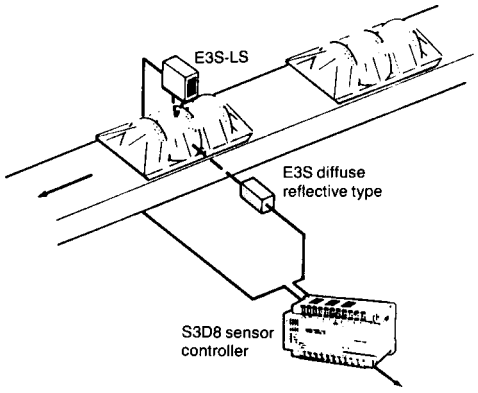
Description	Part number
Mounting bracket (supplied with each sensor)	**E39-L5**
Sensitivity adjuster knob (supplied with each sensor)	**E39-G1**
Alignment aid (supplied with E3S-LS10X□4	**E39-L78**

■ TYPICAL APPLICATIONS

Inspecting bottles for cap presence



Inspecting products in wrapped packages

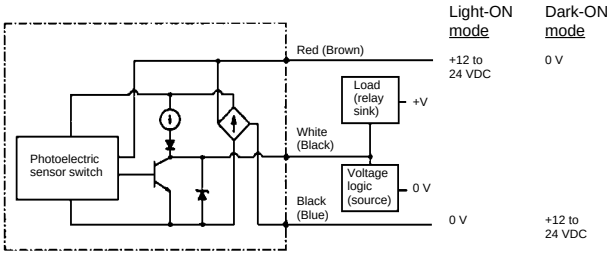


Specifications

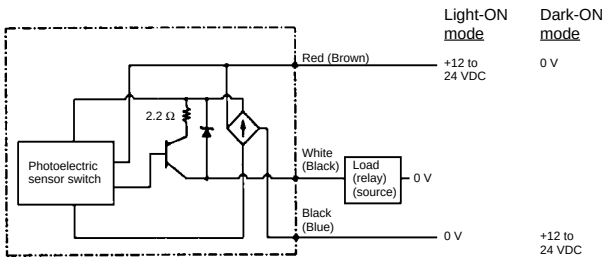
Part number			E3S-LS10X□4	E3S-LS20X□4
Method of detection			Pinpoint focusable diffuse reflective, narrow visibility	Area focusable diffuse reflective, wide visibility
Supply voltage			12 to 24 VDC	
Current consumption			40 mA max.	
Sensing distance			Adjustable, 3 to 10 cm (1.18 to 3.94 in) with 1 x 1 cm (0.39 x 0.39 in) 90% reflectance white mat paper	Adjustable, 5 to 25 cm (1.97 to 9.84 in) with 7.5 x 7.5 cm (2.95 x 2.95 in) 90% reflectance white mat paper
Minimum detectable object			0.6 mm (0.024 in) minimum diameter	10 mm (0.39 in) minimum diameter
Light source			Pulse modulated red LED	Pulse modulated infrared LED
Detectable object type			Opaque and transparent materials	
Sensitivity			Adjustable	
Mutual interference protection			Provided	
Control output	DC solid-state	Type	NPN-SPST open collector with constant current source (E3S-LS□0XE4) PNP-SPST open collector (E3S-LS□0XB4)	
		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-L5 and hardware included	
Connections		Prewired	3-conductor cable, 2 m (6.56 ft) length	
Weight			225 g (7.94 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)	
		Storage	-40° to 70°C (-40° to 158°F)	

■ OUTPUT CIRCUIT DIAGRAMS

NPN output



PNP output

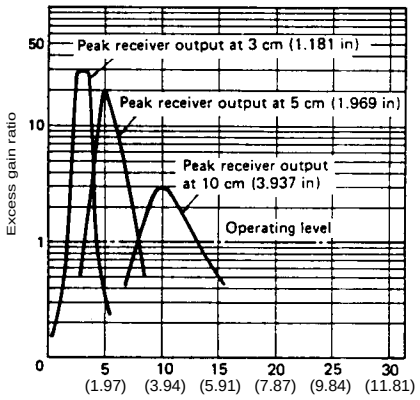


Note: IEC colors are shown in parentheses.

Engineering Data

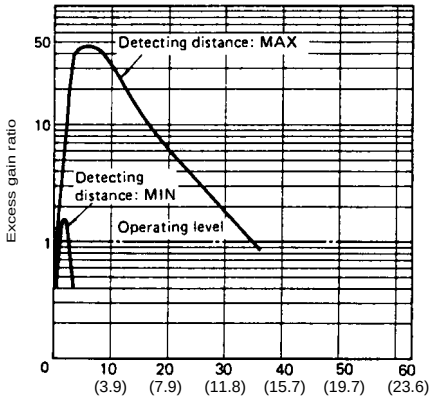
■ EXCESS GAIN RATIO

E3S-LS10X□4



Detecting distance [cm (inch)]
with 1 cm x 1 cm (0.39 x 0.39 in)
90% reflectance mat paper,
at maximum sensitivity

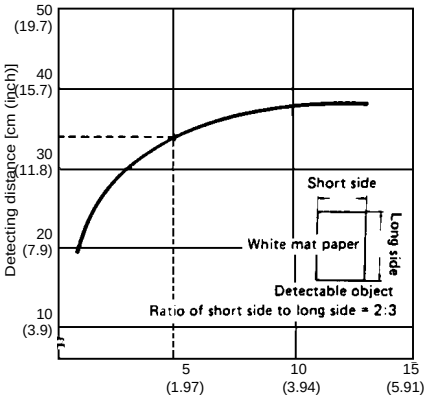
E3S-LS20X□4



Detecting distance [cm (inch)]
with 7.5 cm x 7.5 cm (2.95 x 2.95 in)
90% reflectance mat paper,
at maximum sensitivity

■ DETECTING DISTANCE vs. MINIMUM TARGET SIZE (at maximum sensitivity)

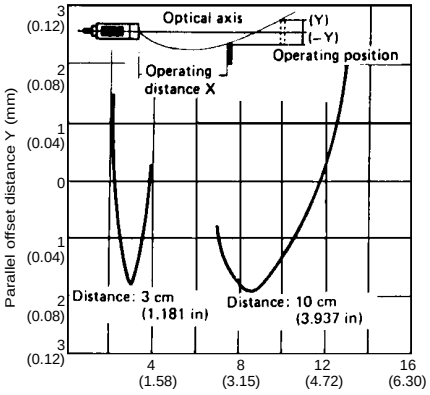
E3S-LS20X□4



Length of short side of object [cm (inch)]

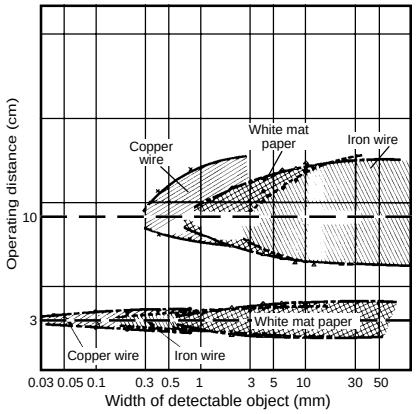
■ OPERATING RANGE

E3S-LS10X□4



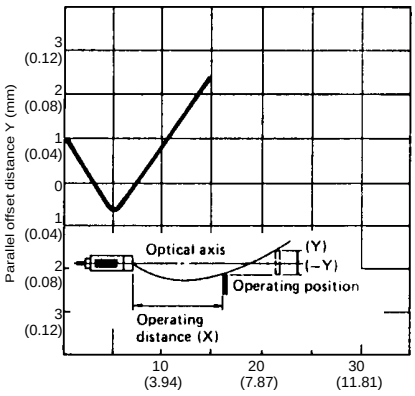
Detecting distance [cm (inch)]
with 5 cm x 5 cm (2 x 2 in)
90% reflectance mat paper,
at maximum sensitivity

E3S-LS10X□4, Minimum Object Sizes



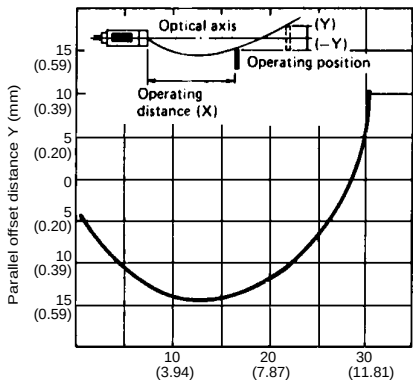
Width of detectable object (mm)

E3S-LS20X□4, Minimum Distance



Detecting distance [cm (inch)]
with 7.5 cm x 7.5 cm (2.95 x 2.95 in)
90% reflectance mat paper,
at maximum sensitivity

E3S-LS20X□4, Maximum Distance



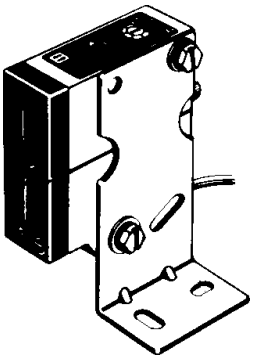
Detecting distance [cm (inch)]
with 7.5 cm x 7.5 cm (2.95 x 2.95 in)
90% reflectance mat paper,
at maximum sensitivity

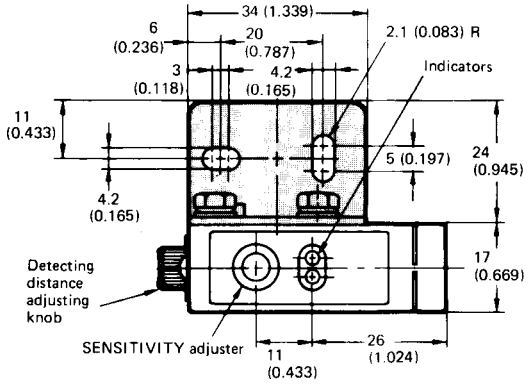
Dimensions

Unit: mm (inch)

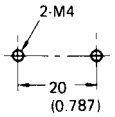
■ SENSORS

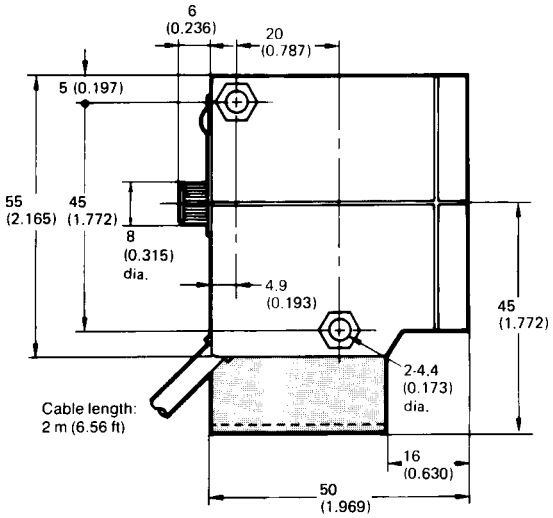
E3S-LS10X□4, E3S-LS20X□4

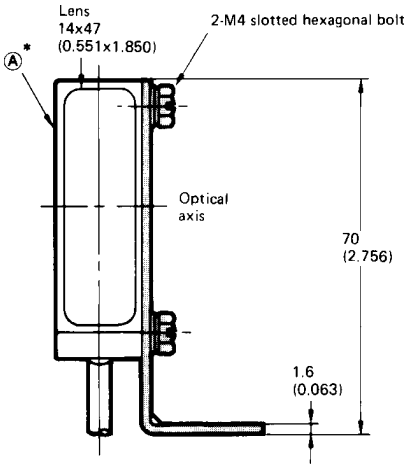




Mounting holes

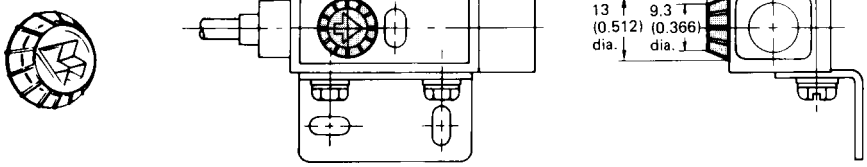






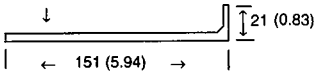
*Mounting bracket E39-L5 may be attached to surface "A".

■ SENSITIVITY ADJUSTER KNOB E39-G1 (included)



■ ALIGNMENT AID E39-L78 (supplied with E3S-LS10X□4)

Note: Ridge on the top surface of the alignment aid - fits into the alignment groove on the sensor.



Operation

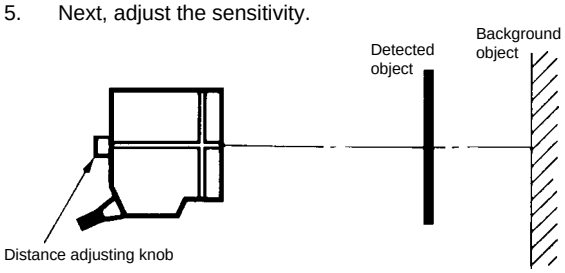
■ DETECTING DISTANCE ADJUSTMENT

Select the proper detecting distance adjustment method based on the conditions listed in the table. Method #2 assumes the amplifier is wired for DARK-ON operation mode.

Conditions	The reflection factor of the object to be detected is equal to, or higher than, that of the background object.	The reflection factor of the object to be detected is less than that of the background object.
Adjustment method	Use Method 1.	Use Method 2.

Adjustment Method 1

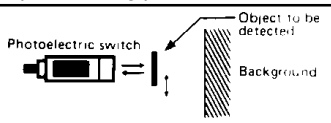
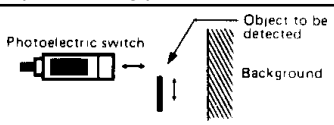
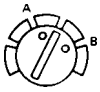
1. Set sensitivity adjuster to center position.
2. Turn the distance adjusting knob fully counterclockwise, for as many turns as necessary, to reach the shortest distance setting "S".
3. Place the object to be detected in position.
4. Turn the distance adjusting knob slowly clockwise, from shortest distance setting "S" toward longest distance setting "L". Stop turning the knob when both LIGHT INCIDENT and STABILITY indicators light. This is the proper distance setting.
5. Next, adjust the sensitivity.



Adjustment Method 2

1. Set sensitivity adjuster to center position.
2. Turn the distance adjusting knob fully counterclockwise, for as many turns as necessary, to reach the longest distance setting "L".
3. Remove the object to be detected, if present.
4. Turn the distance adjusting knob slowly clockwise, from longest distance setting "L" toward the shortest distance setting "S". Watch for the following combination of indicators to light:
   E3S-LS10: Stop turning the knob when both LIGHT INCIDENT and STABILITY indicators light.
   E3S-LS20: Stop turning the knob just before the STABILITY indicator goes out while the LIGHT INCIDENT indicator is lit.
5. Next, adjust the sensitivity.

■ SENSITIVITY ADJUSTMENT

Setting sequence	Step 1: Finding point A	Step 2: Finding point B	Step 3: Final setting
Detecting condition			
Sensitivity adjustment position			
Adjustment procedure	Turn the sensitivity adjuster fully counterclockwise to the Minimum Setting. Place the object to be detected in position, then turn the sensitivity adjuster slowly clockwise until the LIGHT INCIDENT indicator lights. This is reference point "A".	Remove the object to be detected, then turn the sensitivity adjuster fully clockwise to the Maximum setting. Turn the sensitivity adjuster slowly counterclockwise until the LIGHT INCIDENT indicator goes off. This is reference point "B". If the indicator is off at maximum setting, use the maximum setting as reference point "B".	Set the sensitivity adjuster between reference points "A" and "B". Confirm that the STABILITY indicator lights when the object to be detected is in place and when removed from its specified position.

■ ALIGNMENT AID E39-L78

The alignment aid can be used to help in setting the detecting distance with E3S-LS10X□4.
Example: Follow these steps to set the sensor for detecting an object at 5 cm:

1. Follow the ridge of the alignment into the groove of the sensor. (Refer to the drawing in *Dimensions*).
2. Match the line indicating 5 on the alignment aid to the 5 on the back of the sensor (5=5 cm).
3. Starting from the most counterclockwise position, turn the distance adjusting knob clockwise until the indicator mark is in the center of the alignment aid.

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