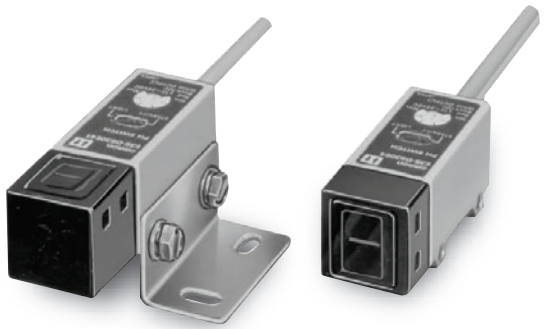
General-purpose Photoelectric Sensor for High Quality and Reliable Detection



Be sure to read *Safety Precautions* on page 8.

Ordering Information

General-purpose Sensors

Sensing method	Appearance	Sensing distance	Operation mode	Model
Through-beam *		2 m	Light-ON/Dark-ON (selectable)	**E3S-2E4** Emitter E3S-2LE4 Receiver E3S-2DE4
		5 m		**E3S-5E4** Emitter E3S-5LE4 Receiver E3S-5DE4
Retro-reflective		0.1 to 2 m		**E3S-R2E4**
Diffuse-reflective		100 mm		**E3S-DS10E4**
		300 mm		**E3S-DS30E4**
Through-beam *		2 m		**E3S-2E41** Emitter E3S-2LE41 Receiver E3S-2DE41
		5 m		**E3S-5E41** Emitter E3S-5LE41 Receiver E3S-5DE41
Retro-reflective		0.1 to 2 m		**E3S-R2E41**
Diffuse-reflective		100 mm		**E3S-DS10E41**
		300 mm		**E3S-DS30E41**
Convergent-reflective (narrow vision field)		30 to 100 mm (variable)		**E3S-LS10XE4**
Convergent-reflective (wide vision field)		50 to 250 mm (variable)		**E3S-LS20XE4**

Note: Sensors with open collectors and different frequencies are available.
* Through-beam Sensors are normally sold in sets that include both the Emitter and Receiver. Orders for individual Emitters and Receivers are accepted.

Ratings and Specifications

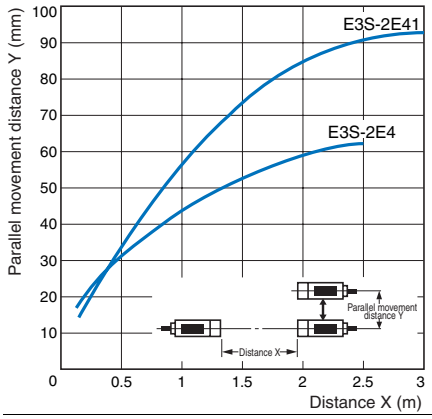
Sensing method		Through-beam		Retro-reflective	Diffuse-reflective			Convergent-reflective	
Item \ Model		E3S-2E4 E3S-2E41	E3S-5E4 E3S-5E41	E3S-R2E4 E3S-R2E41	E3S-DS10E4 E3S-DS10E41	E3S-DS30E41	E3S-DS30E4S	E3S-LS10XE4	E3S-LS20XE4
Sensing distance		2 m	5 m	0.1 to 2 m	100 mm (white paper 50 x 50 mm)	300 mm (white paper 100 x 100)		30 to 100 mm Continuously variable (10 x 10 mm)	50 to 250 mm Continuously variable (50 x 75 mm)
Standard sensing object		Opaque: 7-mm dia. min.	Opaque: 11-mm dia. min.	Opaque: 30-mm dia. min.	Transparent, opaque				
Differential travel		---			20% max. of setting distance			0.5 mm max. at 30 mm 3 mm max. at 100 mm	5% max. at 50 to 250 mm
Directional angle		Both emitter and receiver: 3° to 10°		3° to 10°	---				
Light source (wavelength)		Infrared LED (950 nm)						RED LED (660 nm)	Infrared LED (950 nm)
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p): 10% max.							
Current consumption		50 mA max. (Emitter: 25 mA max., Receiver: 25 mA max.)		40 mA max.					
Control output (solid-state output)		Output current: 1.5 to 4 mA, Load current: 80 mA max. (residual voltage: 2 V max.) ➜ Refer to page 4.							
Response time		Operate or reset: 3 ms max.		Operate or reset: 1 ms max.					
Sensitivity adjustment		With an indicator							
Ambient illumination (Receiver side) *		Incandescent lamp: 3,000 lx max. Sunlight: 10,000 lx max.							
Ambient temperature		Operating: –25 to 55°C, Storage: –40 to 70°C (with no icing or condensation)							
Ambient humidity		Operating: 35% to 85%, Storage: 35% to 95% (with no condensation)							
Insulation resistance		20 MΩ min. at 500 VDC							
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min							
Vibration resistance (destruction)		10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions							
Shock resistance (destruction)		500 m/s^2 3 times each in X, Y, and Z directions							
Degree of protection		IEC IP65	IEC IP67		IEC IP65	IEC IP67			
Connection method		Pre-wired cable (standard length: 2 m)							
Indicators		Light indicator (red), Stability indicator (green)							
Material	Case	Polybutylene terephthalate	Zinc die-cast		Polybutylene terephthalate	Zinc die-cast			
	Lens *	Polycarbonate							
	Mounting Bracket	Iron							

*The ambient operating illumination is the illumination that changes the output ±20% at 200 lx. It is not the operational limit.

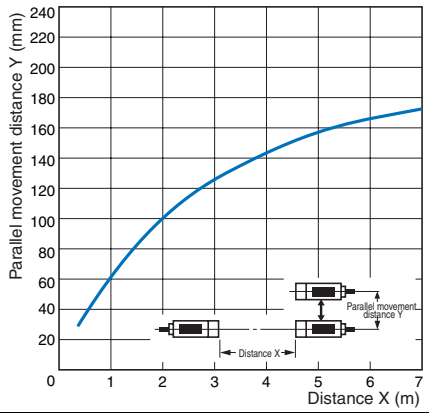
Engineering Data (Typical)

Parallel Operating Range

E3S-2E4 (41)

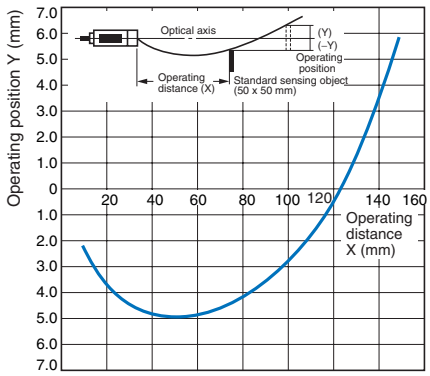


E3S-5E4 (41)

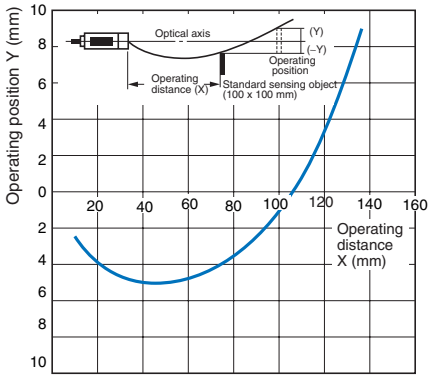


Operating Range

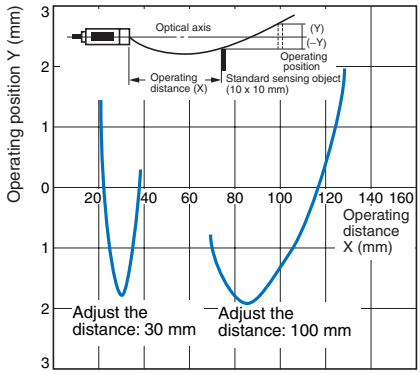
E3S-DS10E4 (41)



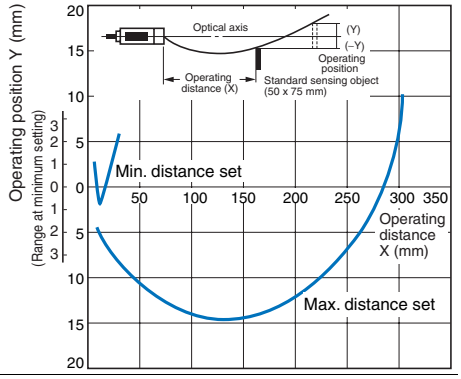
E3S-DS30E4 (41)



E3S-LS10XE4

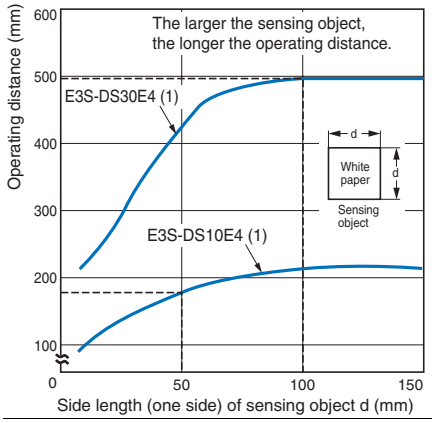


E3S-LS20XE4

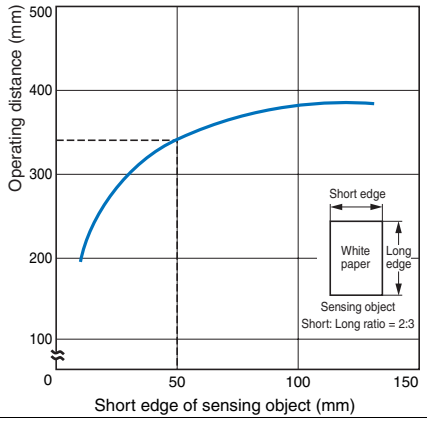


Sensing Distance vs. Size of Sensing Object

E3S-DS30E4 (41)
E3S-DS10E4 (41)

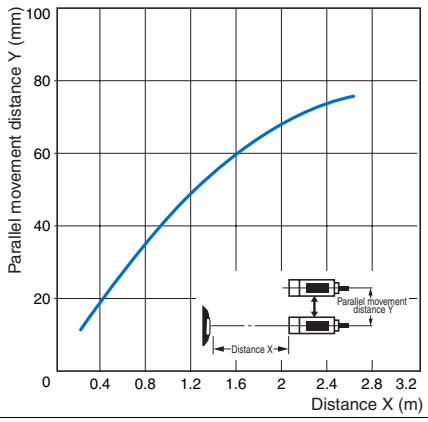


E3S-LS20XE4



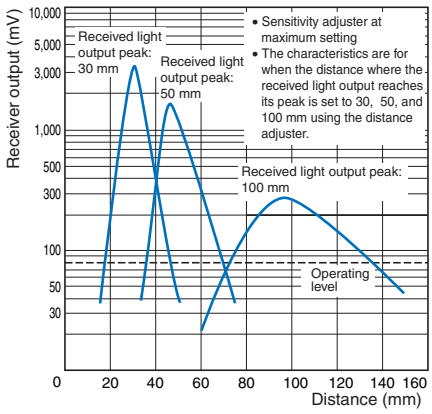
Parallel Operating Range

E3S-R2E4 (41) (42)

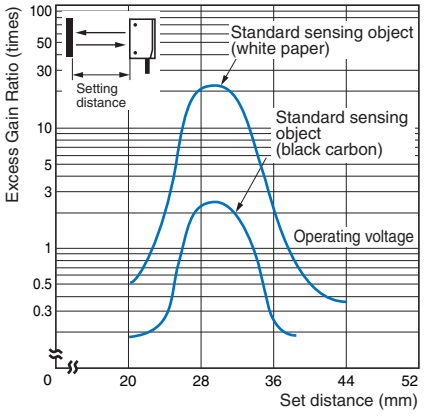


Excess Gain vs. Set Distance

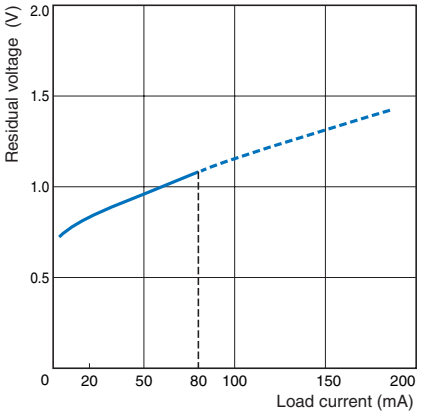
E3S-LS10XE4



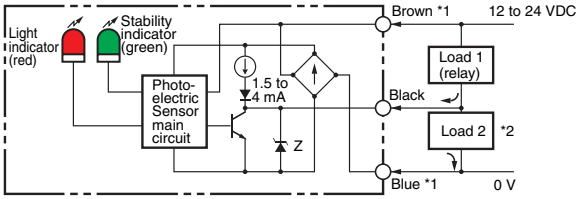
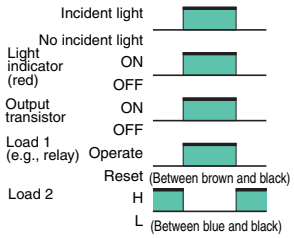
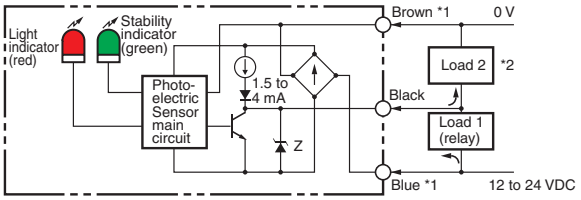
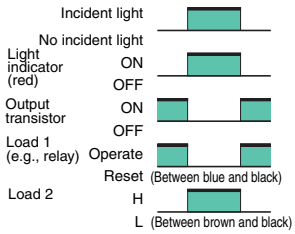
E3S-LS3RC4



Load Residual Voltage Characteristics



I/O Circuit Diagrams

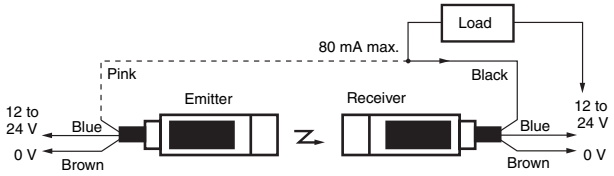
Model	Item: Wire color	Item: Power polarity	Operation mode	Output circuit	Timing charts
E3S	Brown	+	Light-ON	 Z: Zener diode (Vz = 30 V) *1: Reverse the polarity of the power supply to switch the operating mode. *2: Voltage output (when connecting transistor circuit)	
	Blue	0 V			
	Brown	0 V	Dark-ON	 Z: Zener diode (Vz = 30 V) *1: Reverse the polarity of the power supply to switch the operating mode. *2: Voltage output (when connecting transistor circuit)	
	Blue	+			

Connection

● With Relay Load

Through-beam Sensors

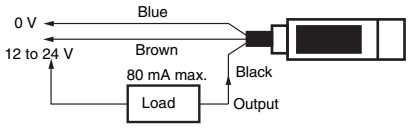
Light Interrupted and Load Operating for E3S-2E4 (41) and -5E4 (41)



Note: The indicator will function as a light indication if the Emitter's pink wire is connected to the Receiver's black wire as indicated by the dotted line. The indicator will function as a power indicator if the Emitter's blue wire is connected to the Emitter's blue wire.

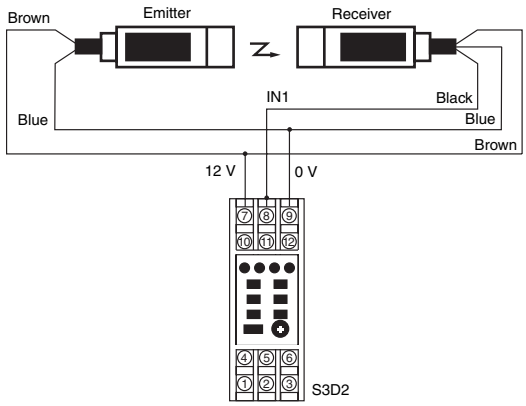
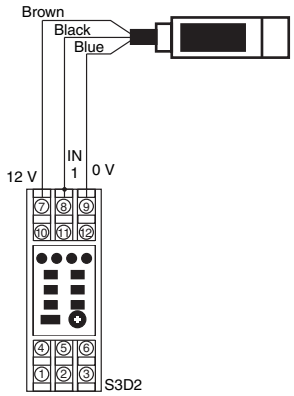
Retro-reflective Sensors

Light Interrupted and Load Operating for E3S-R2E4 (41) (42), -DS10E4(41), and -DS30E4 (41)



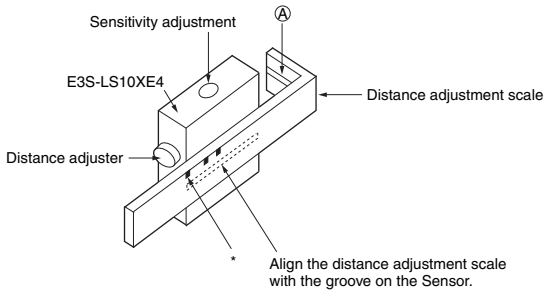
● Connection with S3D2 Sensor Controller

Reverse operation is possible using the signal input switch on the S3D2.

Sensing method	Through-beam	Reflective
Connection method		

Adjustment Methods

● Adjusting the E3S-LS10XE4 Convergent-reflective Sensor

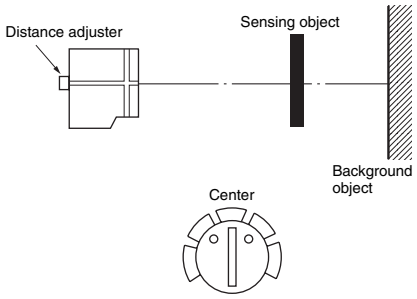


1. Attach the distance adjustment scale as shown in the figure and set it where the * mark is equal to the sensing distance.
2. Turn the distance adjuster until the red spot is at point Ⓐ (center of the distance adjustment scale).
3. Remove the distance adjustment scale once the distance has been adjusted. Put a sensing object in place, and then adjust the sensitivity.

● Adjusting the E3S-LS20XE4 Convergent-reflective Sensor

Adjustment Method 1

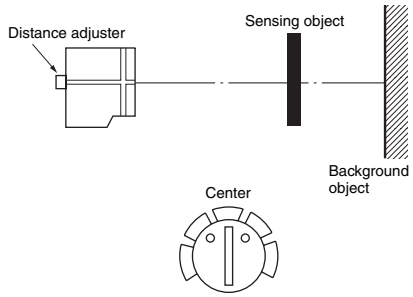
Use this method if the sensing object is more reflective than the background.



1. Set the sensitivity adjuster to the center as shown in the figure.
2. Turn the distance adjuster counterclockwise until it is fully turned (L to S).
3. Position the sensing object.
4. Slowly turn the distance adjuster clockwise (S to L).
5. Eventually the LIGHT (red) indicator will light. Turning the adjuster further will light the STABILITY (green) indicator. Leave the distance adjuster at this level.
6. Adjust the sensitivity in this state.

Adjustment Method 2

Use this method if the background is more reflective than the sensing object.



1. Set the sensitivity adjuster to the center as shown in the figure.
2. Turn the distance adjuster clockwise until it is fully turned (S to L).
3. Remove the sensing object.
4. Slowly turn the distance adjuster counterclockwise (L to S).
5. Eventually the LIGHT (red) indicator will light. Turning the adjuster further will light the STABILITY (green) indicator.
6. Adjust the sensitivity in this state.

Safety Precautions

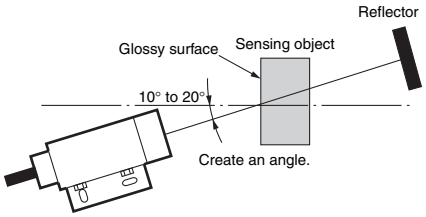
⚠ WARNING

This product is not designed or rated for ensuring safety of persons.
Do not use it for such purposes.

Precautions for Correct Use

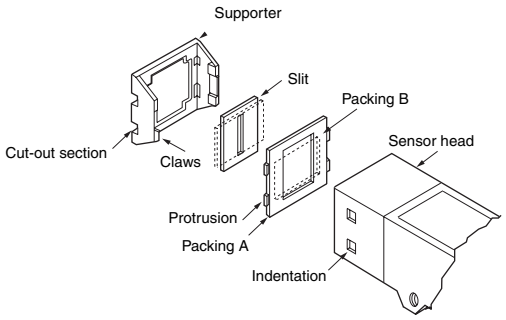
Do not use the product in atmospheres or environments that exceed product ratings.

If the sensing object has a metallic or shiny surface, the E3S-R may not detect it properly. To avoid this situation, place the sensing object so that it is not at right angles to the Photoelectric Sensor.



● **Attaching the E39-S Slit**

- The Slit can be fitted vertically or horizontally as indicated by the dotted line. Make sure that Slits for the Emitter and the Receiver are fitted in the same orientation.
- Place the packing in the supporter and hook the claws on the indentations in the Sensor head.
- If the supporter is contacting the mounting surface, insert a spacer to separate it. (Refer to *Slit Dimensions*.)
- An operating position accuracy of 0.1 mm max. can be achieved for a Through-beam Sensor without Slits.



Sensor with Slits

Applicable Photoelectric Sensor	E3S-5E4, -5E41				E3S-2E4, -2E41		
Model	E39-S1				E39-S2		
Item / Slit width	0.5 mm	1 mm	2 mm	4 mm	0.5 mm	1 mm	2 mm
Sensing distance	230 mm	580 mm	1200 mm	2500 mm	170 mm	420 mm	820 mm
Sensing object	0.5 mm	1 mm	2 mm	4 mm	0.5 mm	1 mm	2 mm
Degree of protection	IP60						

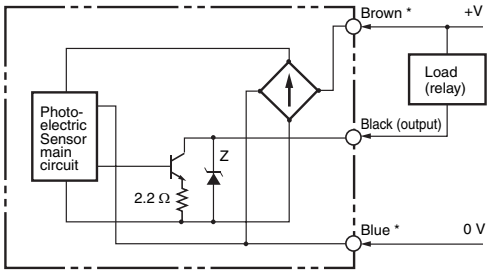
● **Sensors with Open-collector Outputs**

Sensors with Open-collector Outputs

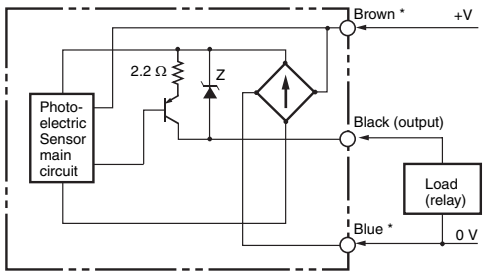
Type	Output type	Output transistor	Rated current output	Switching current	Output protection circuit
E	Voltage or current output	NPN	1.5 to 4 mA	80 mA max. (sinking)	Provided against an increase in the residual output voltage
C	Open-collector output	NPN	---	100 mA max. (sinking)	Provided: Output transistor cutoff
B	Open-collector output	PNP	---	100 mA max. (sourcing)	Provided: Output transistor cutoff

The model numbers are as follows:
Example:
E3S-DS10E4 (E type)
E3S-DS1C4 (C type)
E3S-DS1B4 (B type)

C4 (C41, C42) Sensors



C4 (B41, B42) Sensors

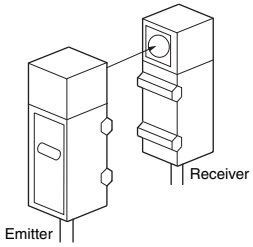
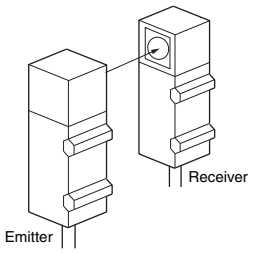
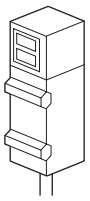


Z: Zener diode (Vz = 30 V)
* The operation mode depends on the wiring of the brown and blue lines.

Note 1. Only C42 models with die-cast cases are available.
2. The Emitter for a Through-beam C4-type Sensor is the same as the Emitter for an E4-type Sensor. (E.g., E3S-5LE4)
3. When a C- or B- type Sensor experiences a load short-circuit or overload, the output transistor will be turned OFF. Check the load conditions before turning the power back ON.

● Sensors with Different Orientations

The E3S-5, E3S-DS30, and E3S-R2 that sense in different directions can be made.

Sensing method	Sensing direction
Through-beam	E3S-5E43 
	E3S-5E44 
Retro-reflective Diffuse-reflective	E3S-DS30E43 E3S-R2E43 

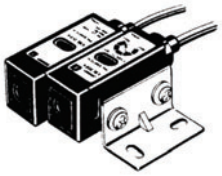
(Unit: mm)

Dimensions

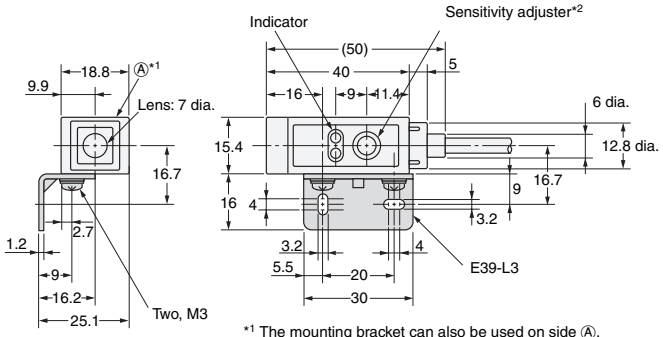
Unless otherwise specified, the tolerance class IT16 is used for dimensions in this data sheet.

General-purpose Sensors

E3S-2E4

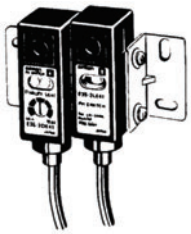


4-dia. vinyl-insulated round cable with 2/3 conductors
(Conductor cross section: 0.2 mm^2,
Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Emitter and Receiver, 80 g each

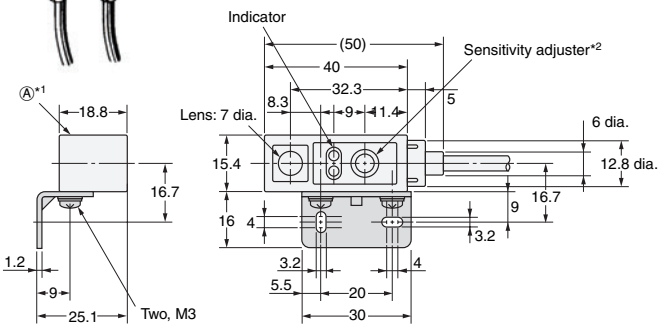


*1 The mounting bracket can also be used on side Ⓐ.
*2 Receiver only.

E3S-2E41

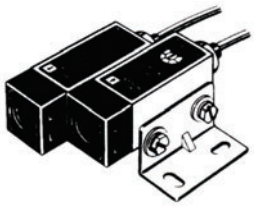


4-dia. vinyl-insulated round cable with 2/3 conductors
(Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Emitter and Receiver, 80 g each

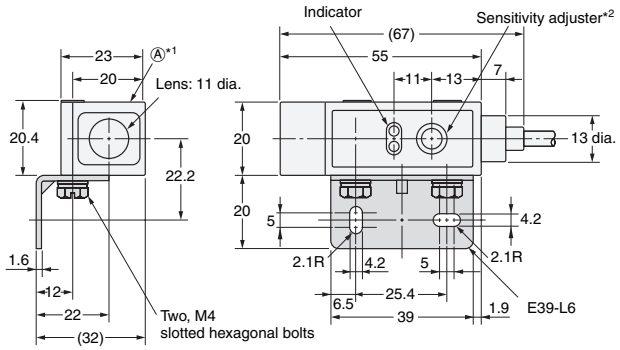


*1 The mounting bracket can also be used on side Ⓐ.
*2 Receiver only.

E3S-5E4

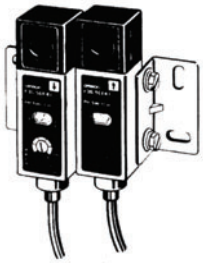


4-dia. vinyl-insulated round cable with 2/3 conductors
(Conductor cross section: 0.2 mm^2,
Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Emitter and Receiver, 155 g each

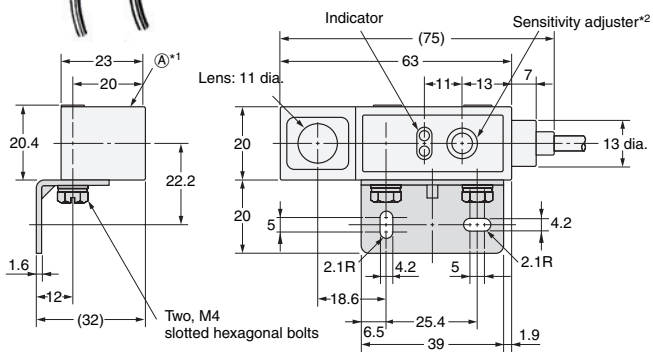


*1 The mounting bracket can also be used on side Ⓐ.
*2 Receiver only.

E3S-5E41



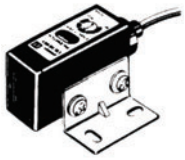
4-dia. vinyl-insulated round cable with 2/3 conductors
(Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Emitter and Receiver, 165 g each



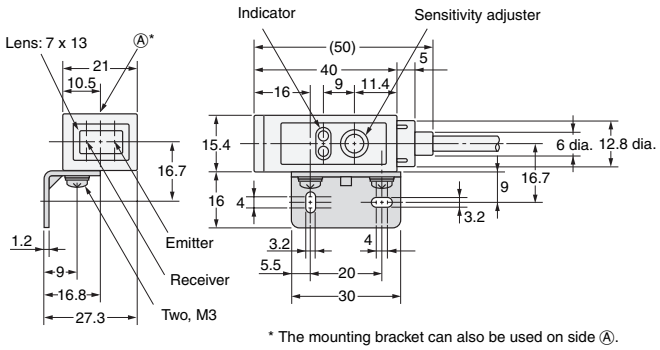
*1 The mounting bracket can also be used on side Ⓐ.
*2 Receiver only.

Note: Models numbers for Through-beam Sensors (E3S-□E4, E3S-□E41) are for sets that include both the Emitter and Receiver. The model number of the Emitter is expressed by adding "L" to the set model number (example: E3S-2LE4), the model number of the Receiver, by adding "D" (example: E3S-2DE4.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

E3S-DS10E4

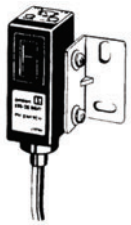


4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Approx. 80 g

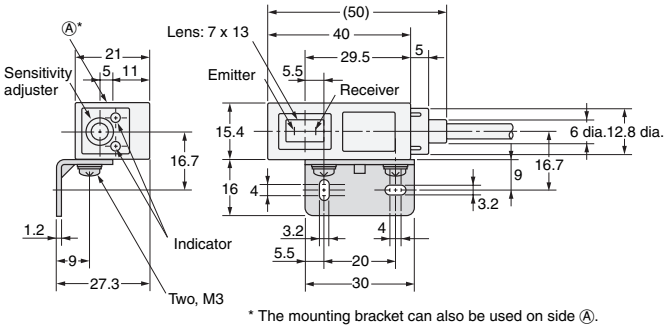


* The mounting bracket can also be used on side Ⓐ.

E3S-DS10E41

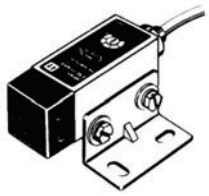


4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Approx. 80 g

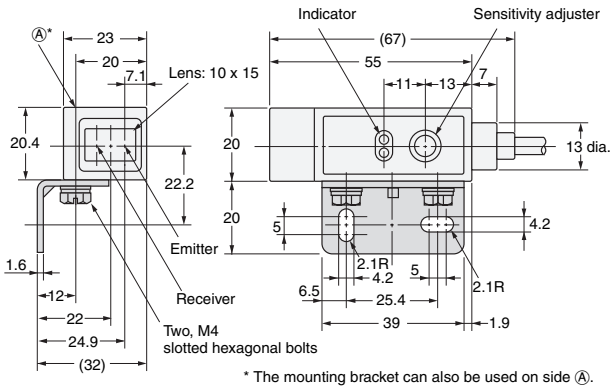


* The mounting bracket can also be used on side Ⓐ.

E3S-R2E4
E3S-DS30E4

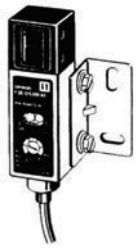


4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Approx. 155 g

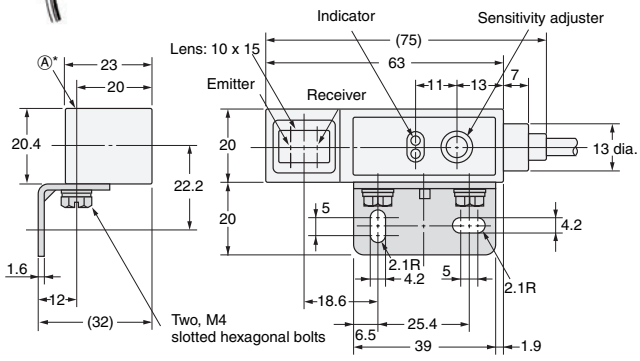


* The mounting bracket can also be used on side Ⓐ.

E3S-R2E41
E3S-DS30E41



4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Approx. 165 g

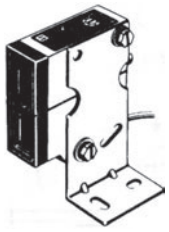


* The mounting bracket can also be used on side Ⓐ.

E3S-R2E42

4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Approx. 165 g

E3S-LS10XE4
E3S-LS20XE4

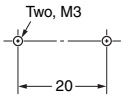


4-dia. vinyl-insulated round cable with 3 conductors
(Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm),
Standard length: 2 m
Weight: Approx. 225 g

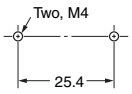
* The mounting bracket can also be used on side Ⓐ.

Mounting Hole Dimensions

E3S-2E4
E3S-2E41
E3S-DS10E4
E3S-DS10E41
E3S-LS10XE4
E3S-LS20XE4



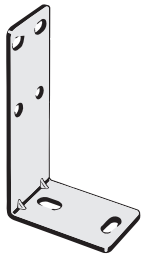
E3S-5E4
E3S-5E41
E3S-R2E4
E3S-R2E41 (42)
E3S-DS30E4
E3S-DS30E41

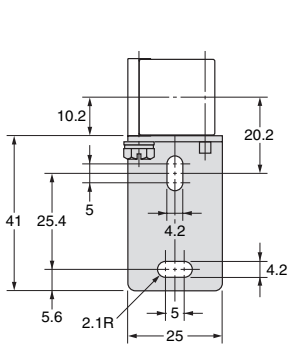


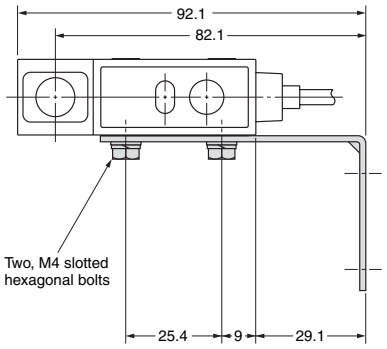
Accessories (Order Separately)

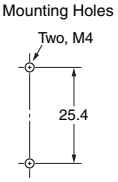
Special Mounting Bracket

E39-L2



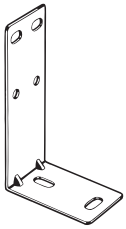


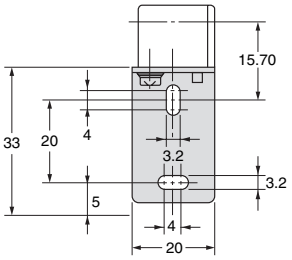


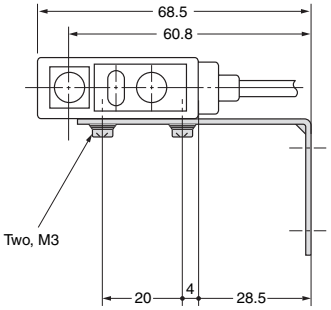


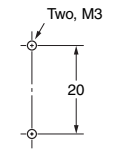
Applicable models:
E3S-5E41
E3S-R2E41
E3S-DS30E41

E39-L4







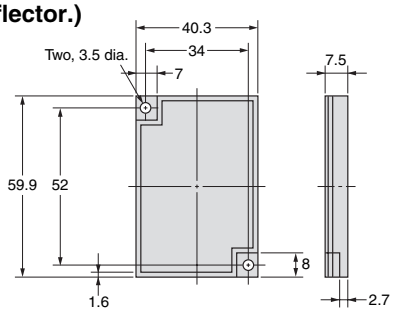


Applicable models:
E3S-2E41
E3S-DS10E41

Reflector

E39-R1

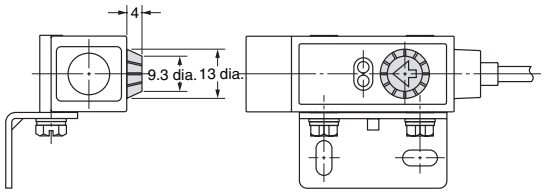
(Provided with the E3S-R2E4(41) Retro-reflective Reflector.)



Material:
Reflective surface: Acrylic
Rear surface: ABS

Sensitivity Adjuster (Provided)

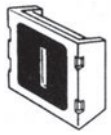
E39-G1

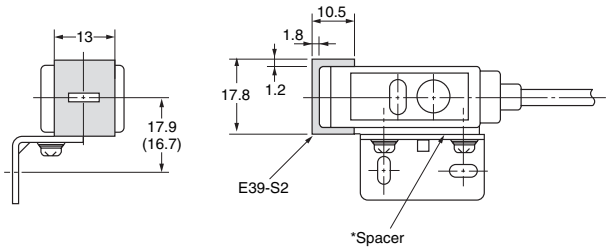


Applicable models:
Provided with the E3S-5E4(41), E3S-DS30E4(41), E3S-R2E4(41).
Note: Cannot be used for the E3S-DS10E4 (41).

Slit (Order Separately)

E39-S2

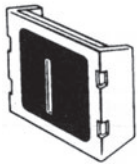


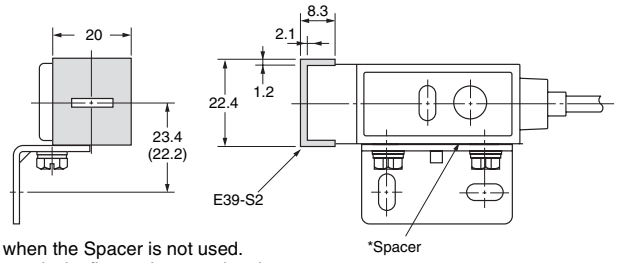


Slit	E39-S2
Applicable Sensors	E3S-2E4 E3S-2E41

Note 1. Three sets of slits are provided: 6.5 x 0.5 mm, 6.5 x 1 mm and 6.5 x 2 mm
2. One set consists of two slits, one each for the Emitter and Receiver.

E39-S1





Slit	E39-S1
Applicable Sensors	E3S-5E4 E3S-5E41

Note 1. Four sets of slits are provided: 11 x 0.5 mm, 11 x 1 mm, 11 x 2 mm, and 11 x 4 mm
2. One set consists of two slits, one each for the Emitter and Receiver.

Note: The dimensions in parentheses are for when the Spacer is not used.
* With the E3S-2E4 (41), use the Spacer as shown in the figure above so that the supporter and Mounting Bracket will not be struck when the optical axis is adjusted.
With the E3S-5E4 (41), the Spacer is not particularly required. Use the Spacer, however, to directly mount both the E3S-2E4 (41) and -5E4 (41).

In the interest of product improvement, specifications are subject to change without notice.

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Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

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2012.8

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