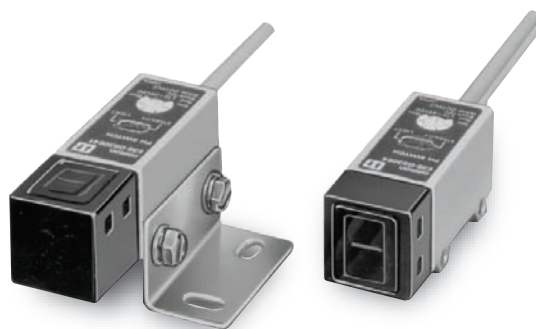


## General-purpose Photoelectric Sensor for High Quality and Reliable Detection


















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

Note: E3S-2/-5/-DS10/-DS30/-R2 in this catalog have been discontinued at the end of March 2014.

## Ordering Information

### General-purpose Sensors

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

\* Production was discontinued.

## Ratings and Specifications

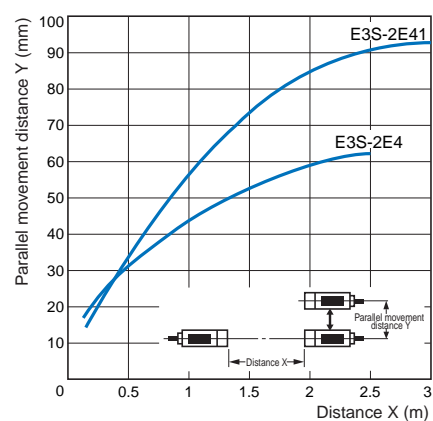
Sensing method  Model  Item		Through-beam		Retro-re- flective	Diffuse-reflective			Convergent-reflective	
		E3S-2E4 E3S-2E41	E3S-5E4 E3S-5E41	E3S-R2E4 E3S-R2E41	E3S- DS10E4 E3S- DS10E41	E3S- DS30E41	E3S- DS30E4S	E3S- LS10XE4	E3S- LS20XE4
Sensing distance		2 m	5 m	0.1 to 2 m	100 mm (white paper 50 x 50 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			1.5 mm max. at 30 mm  10 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 out- put)		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/s² 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	Polybuty- lene tereph- thalate	Zinc die-cast		Polybuty- lene tereph- thalate	Zinc die-cast			
	Lens *	Polycarbonate							
	Mount- ing Bracket	Iron							

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

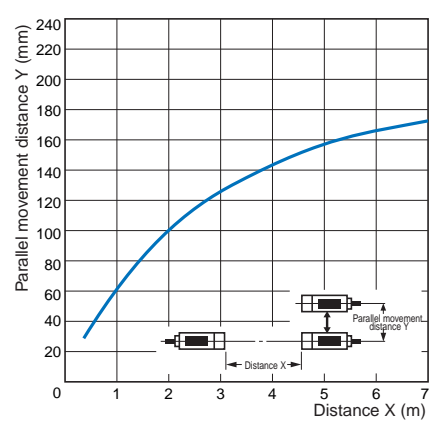
## Engineering Data (Reference Value)

### Parallel Operating Range

#### E3S-2E4 (41)

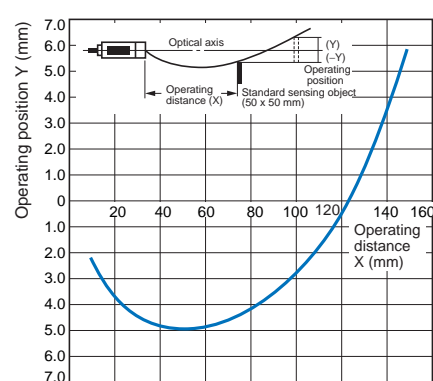


#### E3S-5E4 (41)

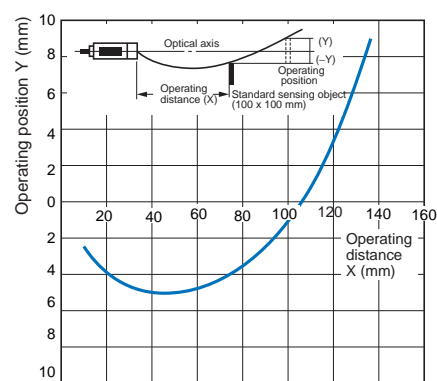


### Operating Range

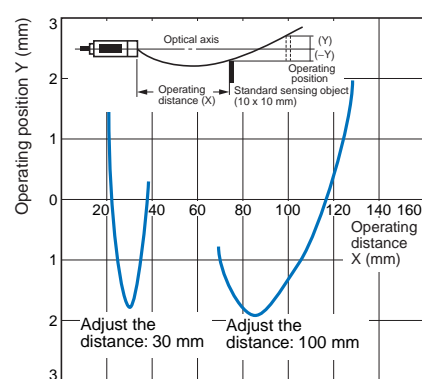
#### E3S-DS10E4 (41)



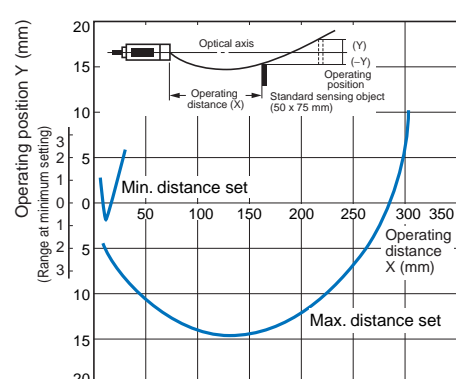
#### E3S-DS30E4 (41)



#### E3S-LS10XE4



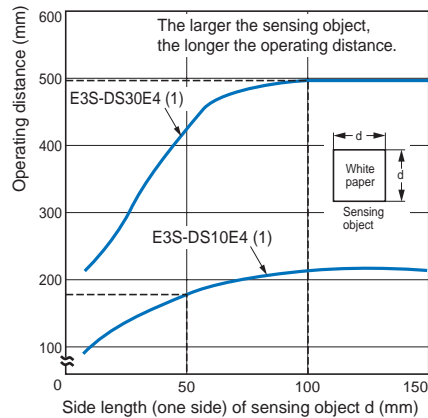
#### E3S-LS20XE4



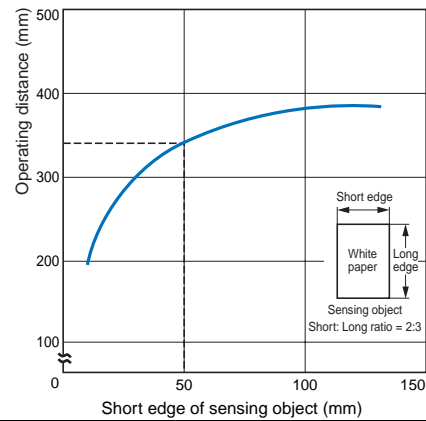
### Sensing Distance vs. Size of Sensing Object

E3S-DS30E4 (41)

E3S-DS10E4 (41)

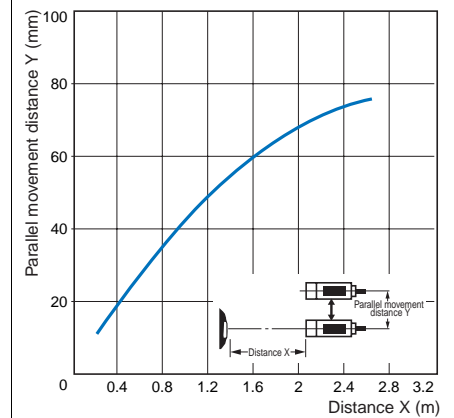


E3S-LS20XE4



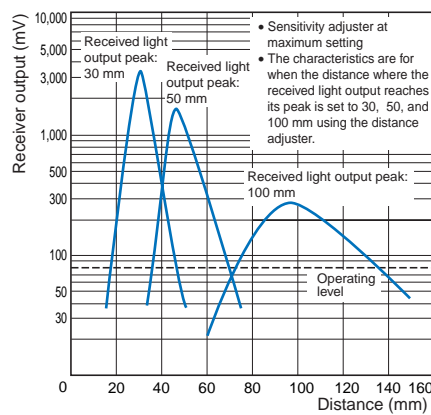
### Parallel Operating Range

E3S-R2E4 (41) (42)

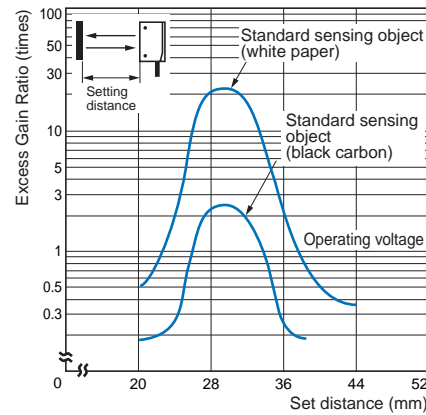


### Excess Gain vs. Set Distance

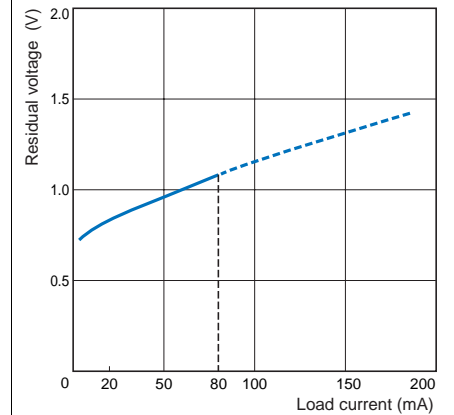
E3S-LS10XE4



E3S-LS3RC4



### Load Residual Voltage Characteristics



I/O Circuit Diagrams

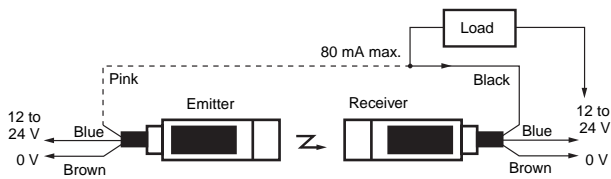
Model	Wire color	Item Power polarity	Operation mode	Output circuit	Timing charts
E3S	Brown	+	Light-ON	<p>Z: Zener diode (<math>V_z = 30\text{ V}</math>) *1: Reverse the polarity of the power supply to switch the operating mode. *2: Voltage output (when connecting transistor circuit)</p>	<p>Incident light</p> <p>No incident light</p> <p>Light indicator (red)</p> <p>ON</p> <p>OFF</p> <p>Output transistor</p> <p>ON</p> <p>OFF</p> <p>Load 1 (e.g., relay)</p> <p>Operate</p> <p>Reset (Between brown and black)</p> <p>H</p> <p>L (Between blue and black)</p>
	Blue	0 V			
	Brown	0 V	Dark-ON	<p>Z: Zener diode (<math>V_z = 30\text{ V}</math>) *1: Reverse the polarity of the power supply to switch the operating mode. *2: Voltage output (when connecting transistor circuit)</p>	<p>Incident light</p> <p>No incident light</p> <p>Light indicator (red)</p> <p>ON</p> <p>OFF</p> <p>Output transistor</p> <p>ON</p> <p>OFF</p> <p>Load 1 (e.g., relay)</p> <p>Operate</p> <p>Reset (Between blue and black)</p> <p>H</p> <p>L (Between brown and black)</p>
	Blue	+			

Connection

● With Relay Load

Through-beam Sensors

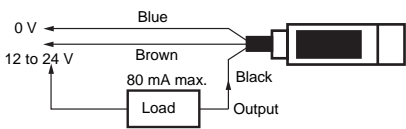
Light Interrupted and Load Operating for E3S-2E4 (41) and -5E4 (41)



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 pink 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)



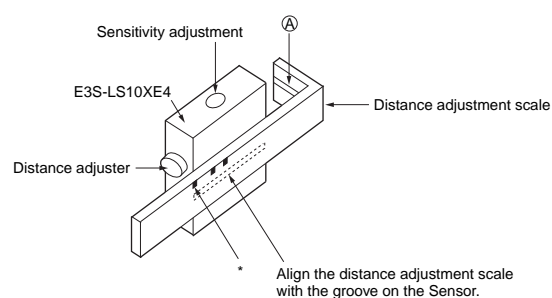
● Connection with S3D2 Sensor Controller

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

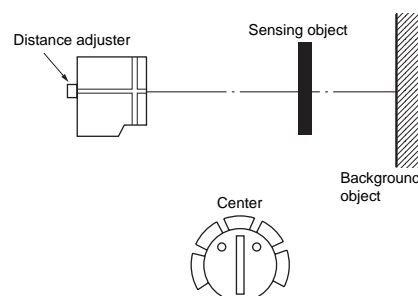


1. Attach the distance adjustment scale as shown in the figure and set it where the \* mark is equal to the sensing distance.
2. Turn the distance adjuster until the red spot is at point A (center of the distance adjustment scale).
3. Remove the distance adjustment scale once the distance has been adjusted.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

### ● Adjusting the E3S-LS20XE4 Convergent-reflective Sensor

#### Adjustment Method 1

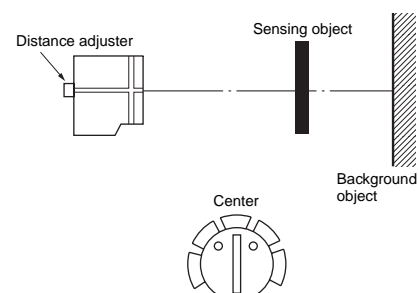
Use this method if the sensing object is more reflective than the background.



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

Be sure to read the precautions for all models in the website at: <http://www.ia.omron.com/>.

### Warning Indications

 <b>WARNING</b>	<b>Warning level</b> Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.
<b>Precautions for Safe Use</b>	Supplementary comments on what to do or avoid doing, to use the product safely.
<b>Precautions for Correct Use</b>	Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.

### Meaning of Product Safety Symbols

	<b>General prohibition</b> Indicates the instructions of unspecified prohibited action.
---	--

### WARNING

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



### Precautions for Safe Use

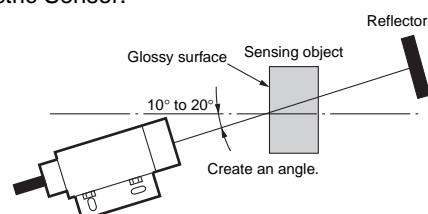
The following precautions must be observed to ensure safe operation.

- Doing so may cause damage or fire. Do not install the product in the following locations.
  - Locations subject to direct sunlight
  - Locations subject to condensation due to high humidity
  - Locations subject to corrosive gas
  - Locations subject to vibration or mechanical shocks exceeding the rated values
  - Locations subject to steam
  - Locations subject to strong magnetic field or electric field
- Do not use the product in environments subject to flammable or explosive gases.
- Do not use a voltage in excess of the operating voltage range. Applying a voltage in excess of the operating voltage range, or applying AC power to a DC Sensor may cause explosion or burning.
- Doing so may cause damage, fire, explosion or malfunction.
  - Never use the product with damaged body or cable.
  - Never disassemble, repair nor tamper with the product.
  - Never use the product with incorrect power supply or wiring.
- Do not short the load. Otherwise explosion or burning may result.
- Do not use the Sensor in environments where the cables may become immersed in oil or other liquids or where liquids may penetrate the Sensor. Doing so may result in damage from burning and fire, particularly if the liquid is flammable.
- Do not use in water or outside.
- When disposing of the product, treat it as industrial waste.

### Precautions for Correct Use

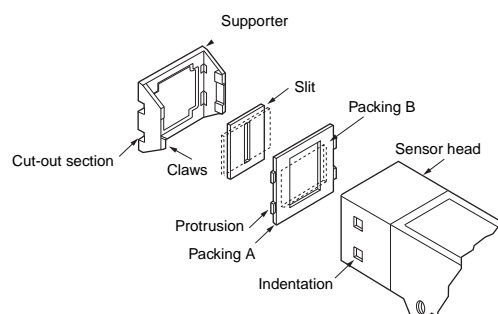
- Do not use the product in any atmosphere or environment that exceeds the ratings.
- Use M4 screws to mount the sensor and tighten each screw to a maximum torque of 1.2 N·m.
- Do not apply the forces on the cable exceeding the following limits:  
Pull: 40 N; torque: 0.1 N·m; pressure: 20 N; bending: 29.4 N
- Make sure to tighten the connectors.
- It may take time until the incident level and measurement value become stable immediately after the power is turned on depending on use environment.
- Burn injury may occur. The product surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Attention must be paid during operation or cleaning.

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 Model		E3S-5E4, -5E41				E3S-2E4, -2E41		
		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:

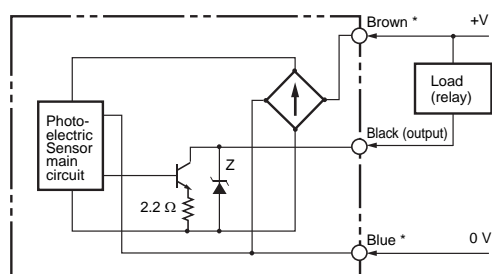
Example:

E3S-DS10E4 (E type)

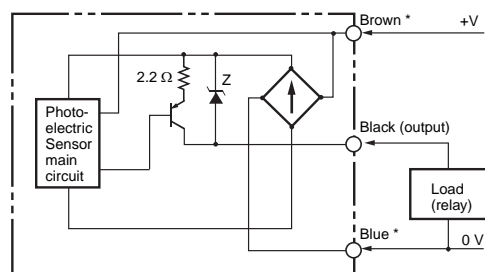
E3S-DS1C4 (C type)

E3S-DS1B4 (B type)

### C4 (C41, C42) Sensors



### C4 (B41, B42) Sensors



Z: Zener diode ( $V_Z = 30\text{ V}$ )

\* The operation mode depends on the wiring of the brown and blue lines.

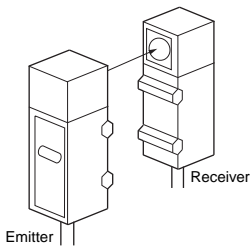
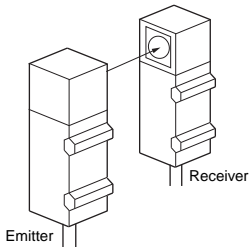
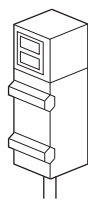
Note 1. Only C42 models with die-cast cases are available.

Note 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)

Note 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.

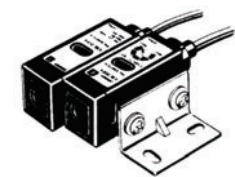
## ● Sensors with Different Orientations

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

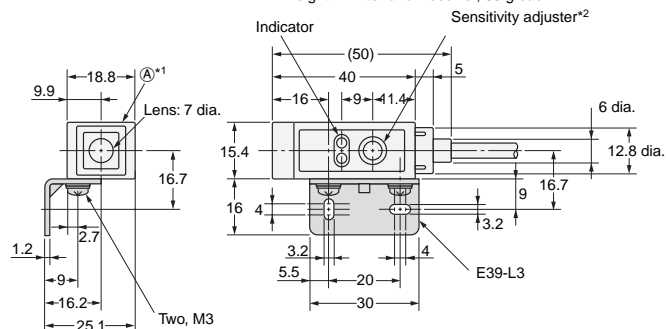
Sensing method	Sensing direction
Through-beam	E3S-5E43 
	E3S-5E44 
Retro-reflective Diffuse-reflective	E3S-DS30E43 E3S-R2E43 

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

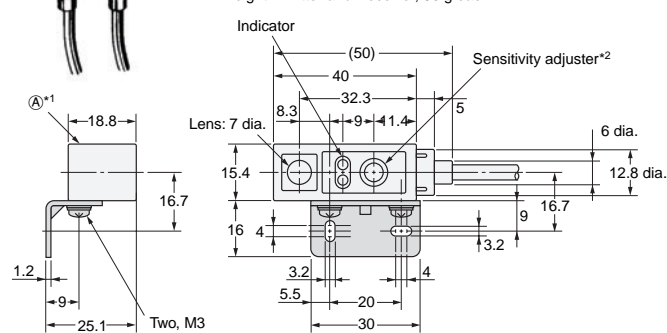
**E3S-2E4**



Indicator Sensitivity adjuster\*2



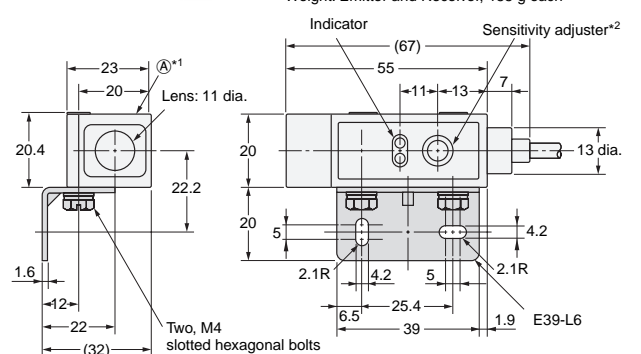
\*1 The mounting bracket can also be used on side (A).  
\*2 Receiver only.



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

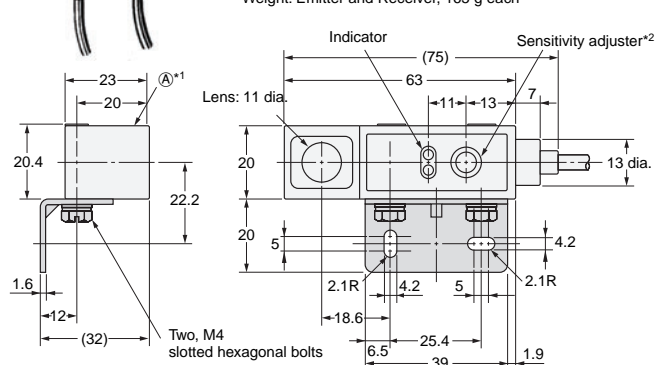
A diagram showing a relay with two coils and two sets of contacts. One coil is connected to a power source (represented by a battery symbol) and the other coil is connected to a load (represented by a light bulb symbol). The contacts are also connected to the power source and the load.

Weight: Emitter and Receiver, 155 g each



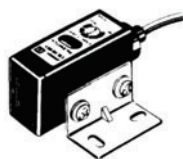
\*1 The mounting bracket can also be used on side (A).  
\*2 Receiver only.

Weight: Emitter and Receiver, 165 g each

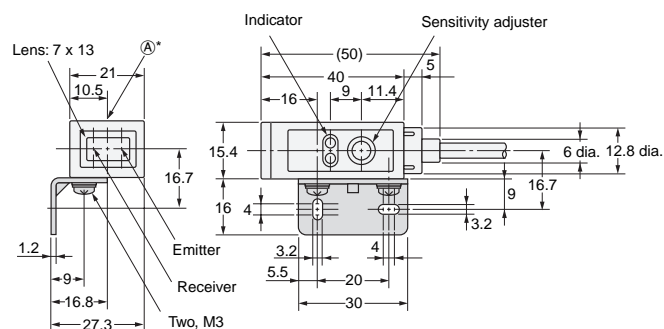


\*1 The mounting bracket can also be used on side (A).  
\*2 Receiver only.

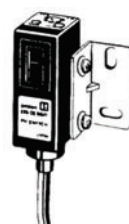
The model number of the Emitter is expressed by adding "L" to the set model number (example: E3S-2LE4), the model number of the Receiver, by adding "D" (example: E3S-2DE4.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

**E3S-DS10E4**

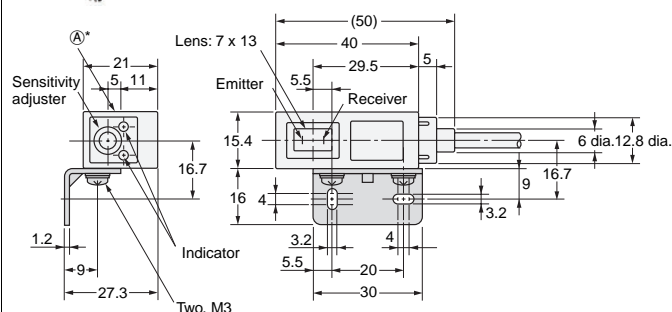
4-dia. vinyl-insulated round cable with 3 conductors  
(Conductor cross section: 0.2 mm<sup>2</sup>, Insulator diameter: 1.1 mm),  
Standard length: 2 m  
Weight: Approx. 80 g



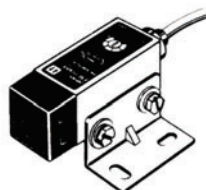
\* The mounting bracket can also be used on side (A).

**E3S-DS10E41**

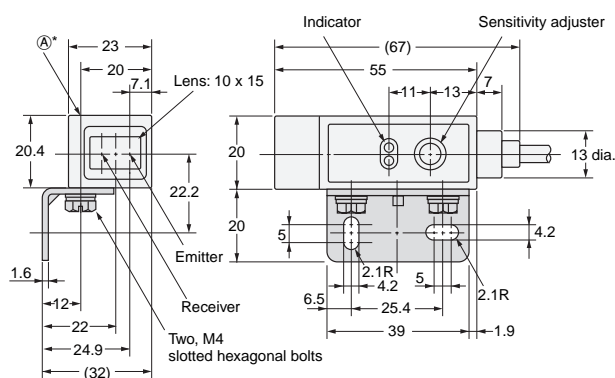
4-dia. vinyl-insulated round cable with 3 conductors  
(Conductor cross section: 0.2 mm<sup>2</sup>, Insulator diameter: 1.1 mm),  
Standard length: 2 m  
Weight: Approx. 80 g



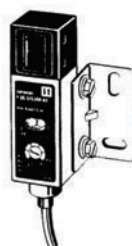
\* The mounting bracket can also be used on side (A).

**E3S-R2E4  
E3S-DS30E4**

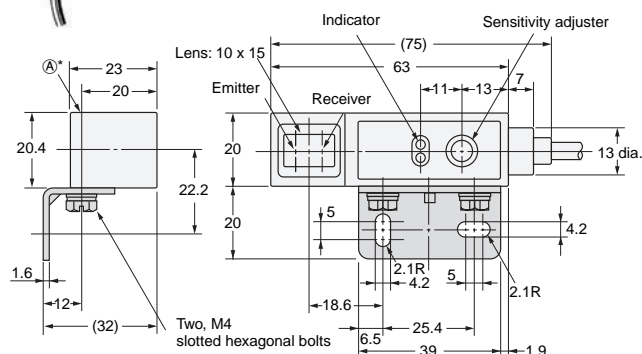
4-dia. vinyl-insulated round cable with 3 conductors  
(Conductor cross section: 0.2 mm<sup>2</sup>, Insulator diameter: 1.1 mm),  
Standard length: 2 m  
Weight: Approx. 155 g



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

**E3S-R2E41  
E3S-DS30E41**

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



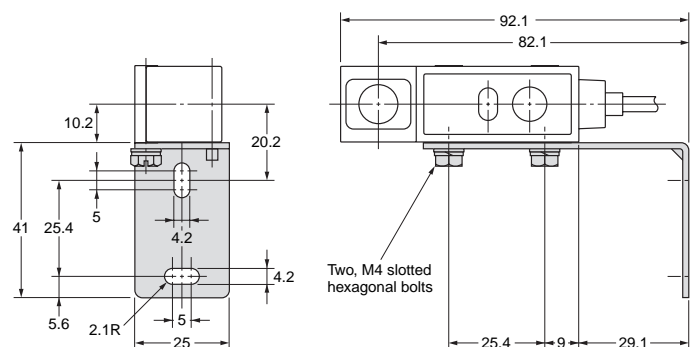
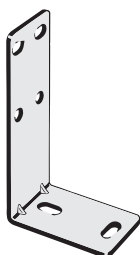
\* The mounting bracket can also be used on side (A).



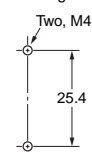
## Accessories (Order Separately)

### Special Mounting Bracket

#### E39-L2

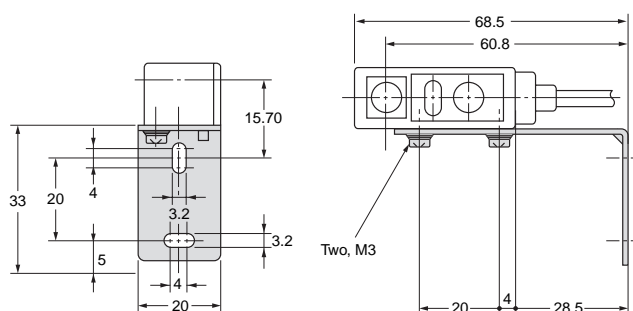
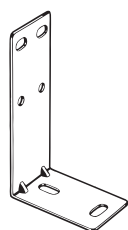


Mounting Holes

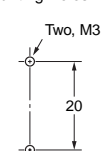


Applicable models:  
E3S-5E41  
E3S-R2E41  
E3S-DS30E41

#### E39-L4



Mounting Holes

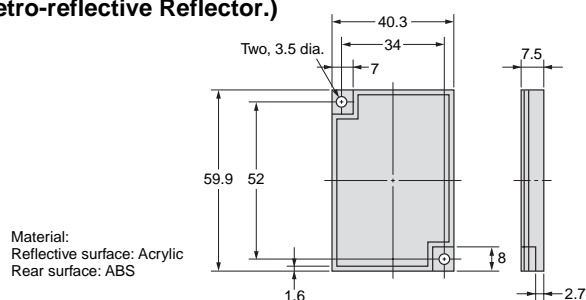


Applicable models:  
E3S-2E41  
E3S-DS10E41

### Reflector

#### E39-R1

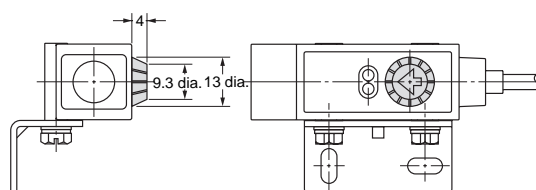
(Provided with the E3S-R2E4(41) Retro-reflective Reflector.)



Material:  
Reflective surface: Acrylic  
Rear surface: ABS

### Sensitivity Adjuster (Provided)

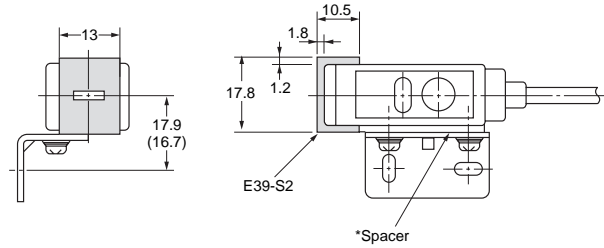
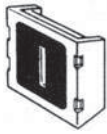
#### E39-G1



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)**

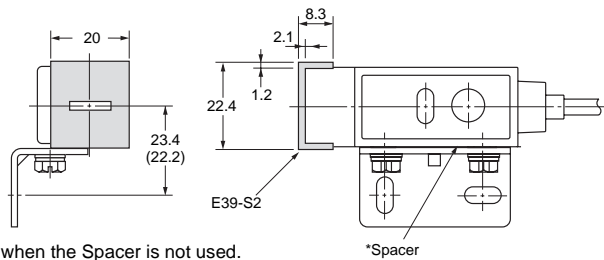
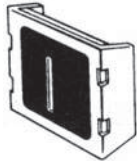
**E39-S2**



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).

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