Thin, Compact, Cylindrical Photoelectric Sensor

E3HF/E3HS/E3HT/E3HC

CSM_E3HF_E3HS_E3HT_E3HC_DS_E_4_1

- Cylindrical models (E3HT and E3HC) are ideal for embedded installation.
- Square 7.5-mm model (E3HS) has a sensing distance of 1 m.
- Resin-filled models (E3HS and E3HC) offer excellent vibration resistance.
- Ultra-thin 7-mm model (E3HF) requires very little depth for installation, helping to save space.
- E3HTand E3HC comply with EN standards.



Be sure to read *Safety Precautions* on page 6.

Ordering Information

Sensors

Infrared light

Sensing Method	Appearance	Sensing distance	Model	
			Light- ON	Dark-ON
Through-beam *		700 mm	**E3HF-1E1** Emitter E3HF-1L Receiver E3HF-1DE1	**E3HF-1E2** Emitter E3HF-1L Receiver E3HF-1DE2
Diffuse-reflective		50 mm	**E3HF-DS5E1**	**E3HF-DS5E2**
Through-beam *		1 m	**E3HS-1E1** Emitter E3HS-1L Receiver E3HS-1DE1	**E3HS-1E2** Emitter E3HS-1L Receiver E3HS-1DE2
Diffuse-reflective		50 mm	**E3HS-DS5E1**	**E3HS-DS5E2**
Through-beam *		1 m	**E3HT-1E1** Emitter E3HT-1L Receiver E3HT-1DE1	**E3HT-1E2** Emitter E3HT-1L Receiver E3HT-1DE2
Diffuse-reflective		35 mm	**E3HT-DS3E1**	**E3HT-DS3E2**
Through-beam *		1 m	**E3HC-1E1** Emitter E3HC-1L Receiver E3HC-1DE1	**E3HC-1E2** Emitter E3HC-1L Receiver E3HC-1DE2
Diffuse-reflective		35 mm	**E3HC-DS3E1**	**E3HC-DS3E2**

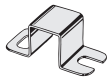
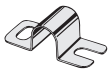
* Through-beam Sensors are normally sold in sets that include both the Emitter and Receiver. Orders for individual Emitters and Receivers are accepted.

Accessories

Slits

Slit width	Sensing distance	Minimum detectable object (typical)	Quantity	Remarks
0.5 mm × 4 mm	120 mm	0.5-mm dia.	1 slit each for the Emitter and Receiver (6 slits total)	Seal-type long slit Provided with the E3HF-1E□ Through-beam Sensor.
1 mm × 4 mm	200 mm	1-mm dia.		
2 mm × 4 mm	400 mm	2-mm dia.		

Mounting Brackets

Appearance	Model	Quantity	Remark
	**E39-L101**	1	Provided with the E3HS
	**E39-L84**	1	Provided with the E3HC

Note: When using through-beam models, order one bracket for the Receiver and one for the Emitter.

Ratings and Specifications

E3HF/E3HS

Sensing method	Through-beam	Diffuse-reflective	Through-beam	Diffuse-reflective
Item / Model	E3HF-1E□	E3HF-DS5E□	E3HS-1E□	E3HS-DS5E□
Sensing distance	700 mm	50 mm (White paper 30 × 30 mm)	1 m	50 mm (White paper 30 × 30 mm)
Standard sensing object	Opaque, 3.7-mm dia. min.	---	Opaque, 5.1-mm dia. min.	---
Differential travel	---	20% max. of sensing distance	---	20% max. of sensing distance
Directional angle	Emitter/Receiver: 3 to 20° each	---	Emitter/Receiver: 3 to 25° each	---
Light source (wavelength)	Infrared LED (950 nm)			
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p): 10% max.			
Current consumption	Emitter/Receiver: 20 mA max.	30 mA max.	Emitter/Receiver: 20 mA max.	30 mA max.
Control output	Load power supply voltage: 24 VDC max., Load current: 80 mA (residual voltage: E3HF: 1 V max., E3HS: 1.2 V max.) NPN voltage output type Light-ON/Dark-ON (depends on model)			
Protection	Reverse polarity protection, Output short-circuit protection	Reverse polarity protection, Output short-circuit protection, Mutual interference prevention	Reverse polarity protection, Output short-circuit protection	Reverse polarity protection, Output short-circuit protection, Mutual interference prevention
Response time	Operate or reset: 5 ms max. each	Operate or reset: 3 ms max. each	Operate or reset: 5 ms max. each	Operate or reset: 3 ms max. each
Sensitivity adjustment	---	One-turn adjuster	---	One-turn adjuster
Ambient illuminance (Receiver side)	Incandescent lamp: 3,000 lx, Sunlight 10,000 lx			
Ambient temperature	Operating: –25 to 55°C, Storage: –30 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	500 VAC at 50/60 Hz for 1 minute			
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 for 3 times each in X, Y, and Z directions			
Degree of protection	IEC IP64		IEC IP65	
Connection method	Pre-wired models (standard length: 2 m)			
Weight (packed state)	Approx. 110 g	Approx. 70 g	Approx. 120 g	Approx. 80 g
Material: Case	ABS		Stainless steel (SUS304)	
Material: Lens	Methacrylic resin			
Material: Mounting Brackets	---		Stainless steel (SUS304)	
Accessories	Slit (0.5-mm, 1-mm, 2-mm widths), Instruction sheet	Screwdriver for adjustment, Instruction sheet	Mounting Bracket (with screws), Stoppers, Instruction sheet	Mounting Bracket (with screws), Screwdriver for adjustment, Stoppers, Instruction sheet

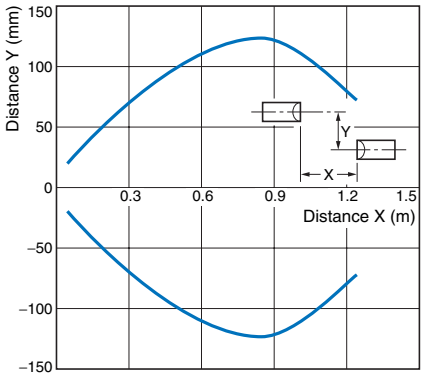
E3HT/E3HC

Sensing method / Item / Model	Through-beam E3HT-1E□	Diffuse-reflective E3HT-DS3E□	Through-beam E3HC-1E□	Diffuse-reflective E3HC-DS3E□
Sensing distance	1 m	35 mm (White paper 30 × 30 mm)	1 m	35 mm (White paper 30 × 30 mm)
Standard sensing object	Opaque, 6.25-mm dia. min.	---	Opaque, 6.25-mm dia. min.	---
Differential travel	---	20% max. of sensing distance	---	20% max. of sensing distance
Directional angle	Emitter/Receiver: 10 to 25° each	---	Emitter/Receiver: 10 to 25° each	---
Light source (wavelength)	Infrared LED (950 nm)	Infrared LED (940 nm)	Infrared LED (950 nm)	Infrared LED (940 nm)
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p): 10% max.			
Current consumption	Emitter: 25 mA max. Receiver: 15 mA max.	30 mA max.	Emitter: 25 mA max. Receiver: 15 mA max.	30 mA max.
Control output	Load power supply voltage: 24 VDC max., Load current: 80 mA (Residual voltage: 1 V max.) NPN open collector output type Light-ON/Dark-ON (depends on model)			
Protection	Reverse polarity protection, Output short-circuit protection	Reverse polarity protection, Output short-circuit protection, Mutual interference prevention	Reverse polarity protection, Output short-circuit protection	Reverse polarity protection, Output short-circuit protection, Mutual interference prevention
Response time	Operate or reset: 5 ms max. each	Operate or reset: 3 ms max. each	Operate or reset: 5 ms max. each	Operate or reset: 3 ms max. each
Ambient illuminance (Receiver side)	Incandescent lamp: 3,000 lx, Sunlight 10,000 lx			
Ambient temperature	Operating: –25 to 55°C, Storage: –30 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	500 VAC at 50/60 Hz for 1 minute			
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 for 3 times each in X, Y, and Z directions			
Degree of protection	IEC IP66			
Connection method	Pre-wired models (standard length: 2 m)			
Weight (packed state)	Approx. 130 g	Approx. 80 g	Approx. 110 g	Approx. 75 g
Material Case	Brass		Stainless steel (SUS304)	
Material Lens	Methacrylic resin			
Material Mounting Brackets	---		Stainless steel (SUS304)	
Accessories	Instruction sheet		Mounting bracket (with screws), Instruction sheet	

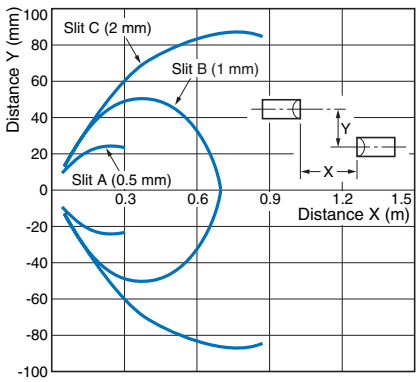
Engineering Data (Typical)

Parallel Operating Range

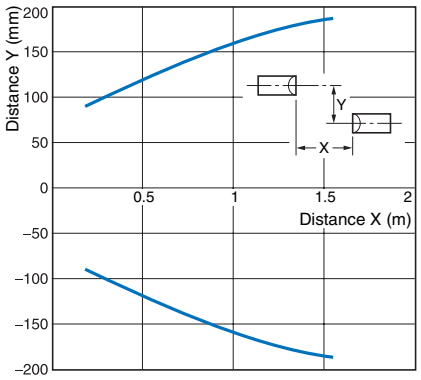
Through-beam
E3HF-1E□



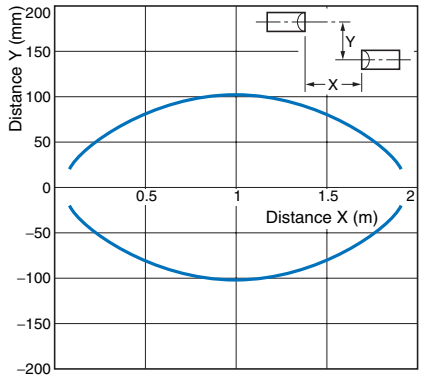
Through-beam
E3HF-1E□



Through-beam
E3HS-1E□

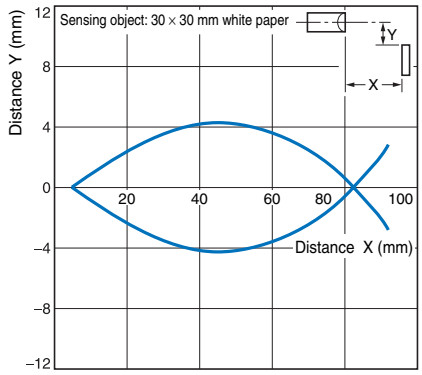


Through-beam
E3HT-1E□, E3HC-1E□

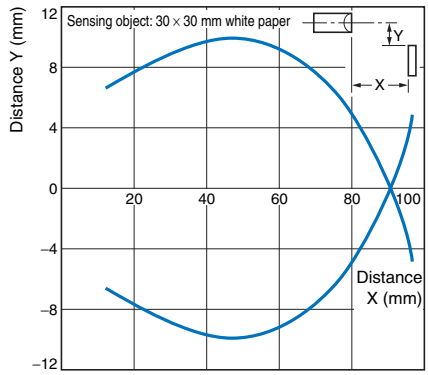


Operating Range

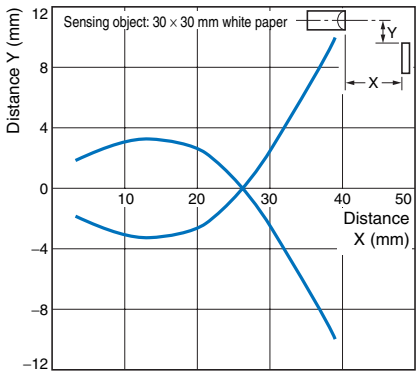
Diffuse-reflective
E3HF-DS5E□



Diffuse-reflective
E3HS-DS5E□

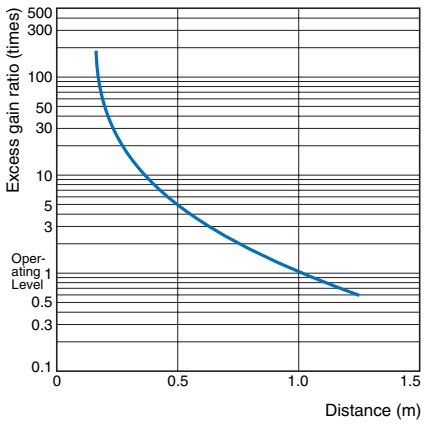


Diffuse-reflective
E3HT-DS3E□, E3HC-DS3E□

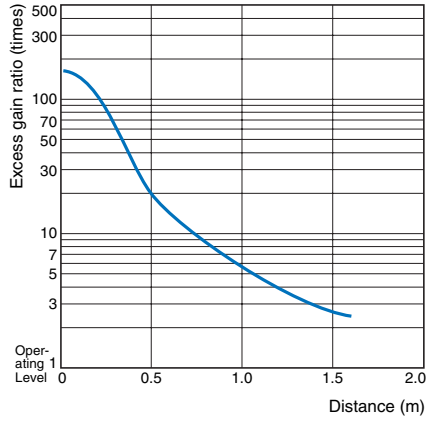


Excess Gain vs. Set Distance

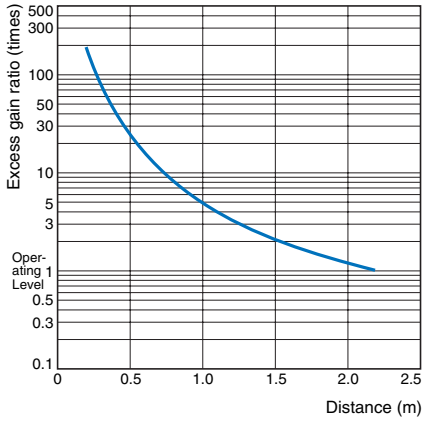
Through-beam
E3HF-1E□



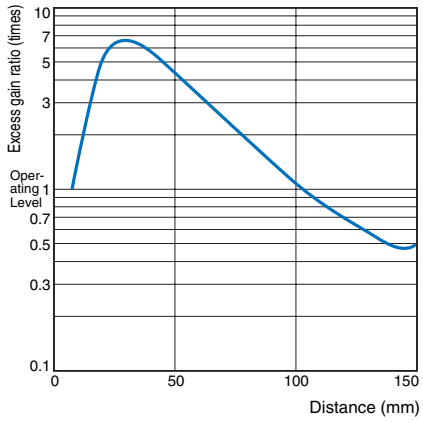
Through-beam
E3HS-1E□



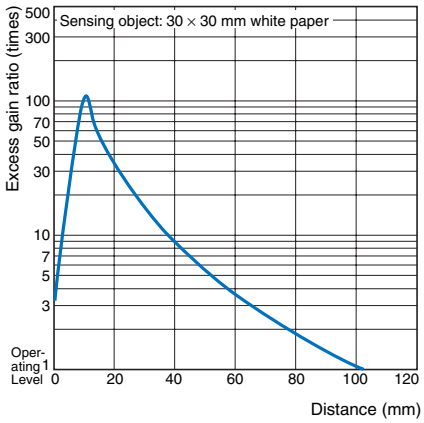
Through-beam
E3HT-1E□, E3HC-1E□



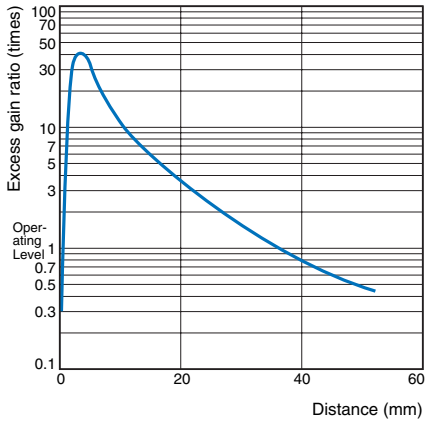
Diffuse-reflective
E3HF-DS5E□



Diffuse-reflective
E3HS-DS5E□

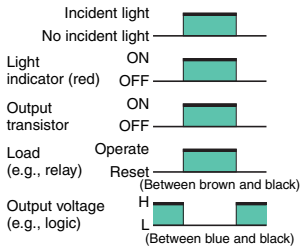
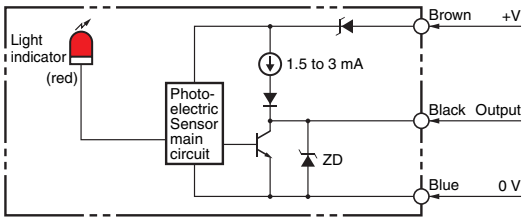
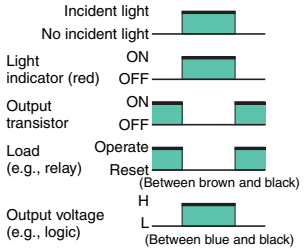


Diffuse-reflective
E3HT-DS3E□, E3HC-DS3E□

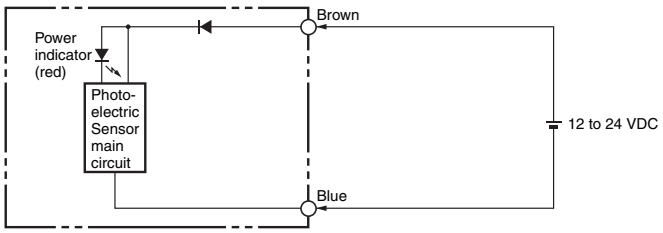


I/O Circuit Diagrams

NPN Output

Model	Operation mode	Timing charts	Output circuit
E3HF-1E1 * **E3HF-DS5E1** **E3HS-1E1 *** **E3HS-DS5E1** **E3HT-1E1 *** **E3HT-DS3E1** **E3HC-1E1 *** **E3HC-DS3E1**	Light-ON		Through-beam Receivers, Reflective Sensors 
E3HF-1E2 * **E3HF-DS5E2** **E3HS-1E2 *** **E3HS-DS5E2** **E3HT-1E2 *** **E3HT-DS3E2** **E3HC-1E2 *** **E3HC-DS3E2**	Dark-ON		

Through-beam Model Emitters



* Models numbers for Through-beam Sensors (E3H□-1E□) are for sets that include both the Emitter and Receiver.
Emitter model numbers are in the form E3H□-1L (e.g., E3HF-1L). Receiver model numbers are in the form E3H□-1DE□ (e.g., E3HF-1DE1). Refer to *Ordering Information* to confirm model numbers for Emitter and Receivers.

Safety Precautions

⚠ WARNIGS

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

Precautions for Correct Use

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

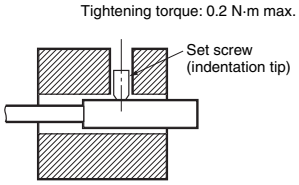
●Mounting

Mounting

E3HF

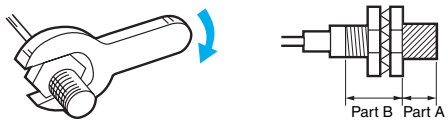
- Use flat washers and spring washers on the M3 screws, and tighten the screws to a torque of 0.29 N·m max.

E3HC



E3HT

- Do not tighten to a torque that exceeds the following values.



Note: The allowable torque depends on the distance from the tip of the head. Refer to the following table for the tightening torque for parts A and B. (Part A is the range between the tip of the head and the value given in the table. Part B includes the nut on the head, as shown in the figure above. If the edge of the nut enters the area of part A even slightly, apply the torque for part A.)

Torque / Model	Part A		Part B
	Dimension (mm)	Torque	Torque
E3HT-□□□	12	2 N·m	2.9 N·m

●Adjusting

Slit Adjustment

E3HF

- Slits with widths of 0.5, 1.0, and 2.0 mm are provided. Use these slits for adjustment when the diameter of the sensing object is 3.7 mm or less, and when it is necessary to correct for mutual interference.

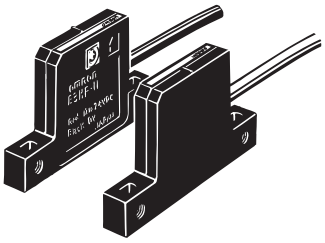
Dimensions

(Unit: mm)

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

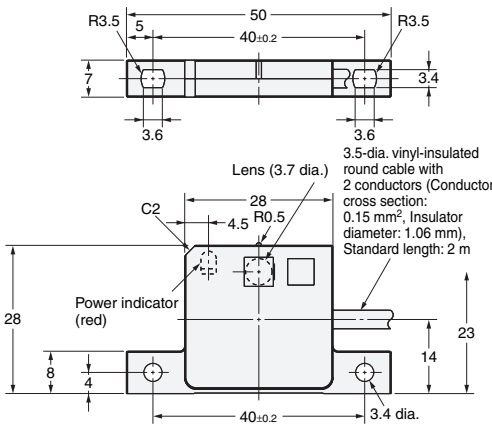
Sensors

E3HF-1E□

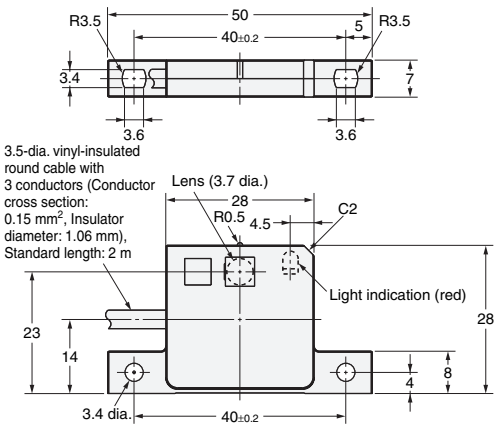


Emitter: E3HF-1L
Receiver: E3HF-1DE□

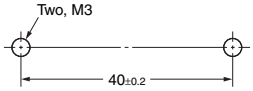
Emitter



Receiver

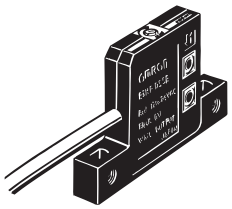


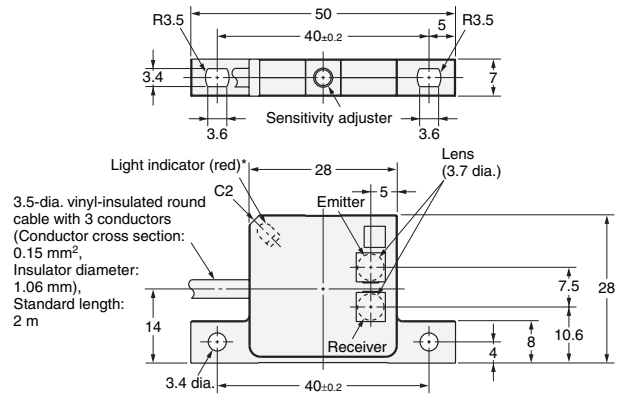
Mounting Holes



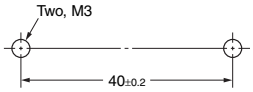
Note: Models numbers for Through-beam Sensors (E3HF-1E□) are for sets that include both the Emitter and Receiver. The Emitter model number is E3HF-1L. Receiver model numbers are in the form E3HF-1DE□ (e.g., E3HF-1DE1). Refer to *Ordering Information* to confirm model numbers for Emitter and Receivers.

E3HF-DS5E□



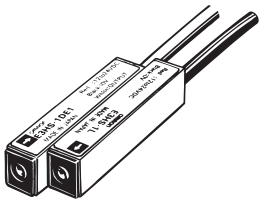


Mounting Holes

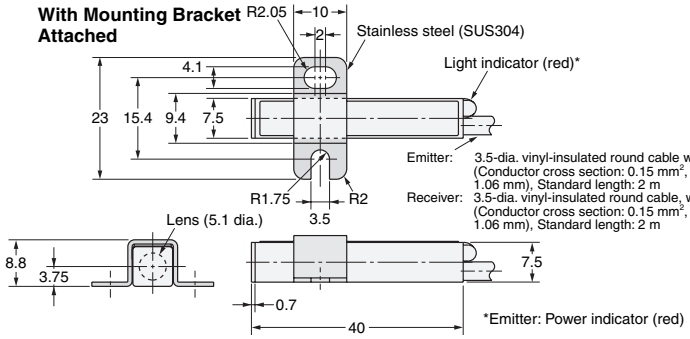


* The indicator is not visible from the lens surface.

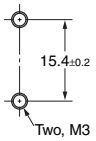
E3HS-1E□



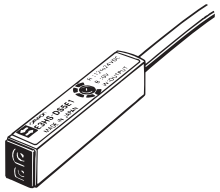
With Mounting Bracket Attached



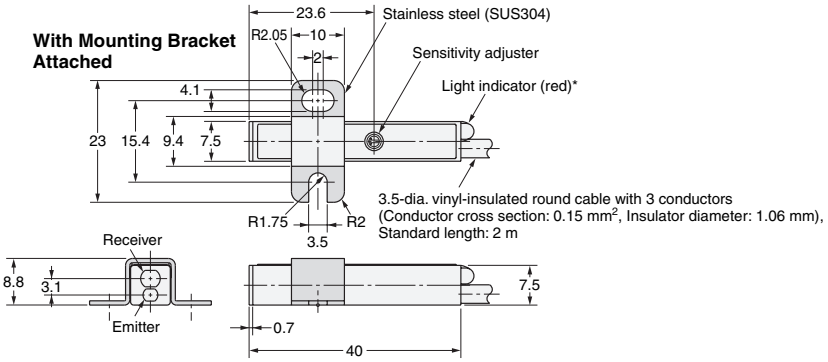
Mounting Holes



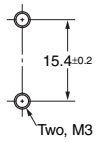
E3HS-DS5E□



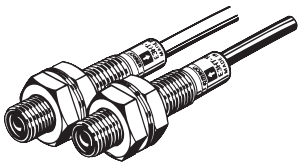
With Mounting Bracket Attached

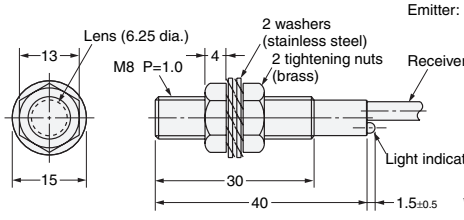


Mounting Holes



E3HT-1E□





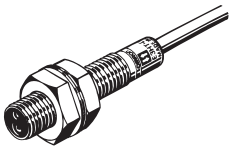
Emitter: 3.5-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.15 mm², Insulator diameter: 1.06 mm), Standard length: 2 m

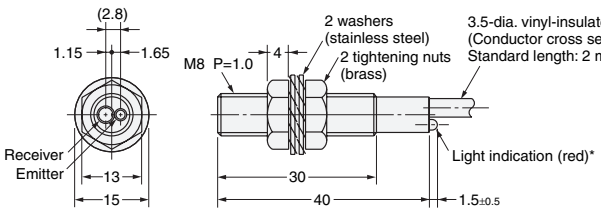
Receiver: 3.5-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.15 mm², Insulator diameter: 1.06 mm), Standard length: 2 m

Light indicator (red)*

* Emitter has a power indicator (red).

E3HT-DS3E□



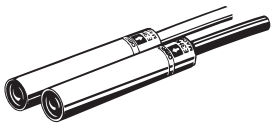


3.5-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.15 mm², Insulator diameter: 1.06 mm), Standard length: 2 m

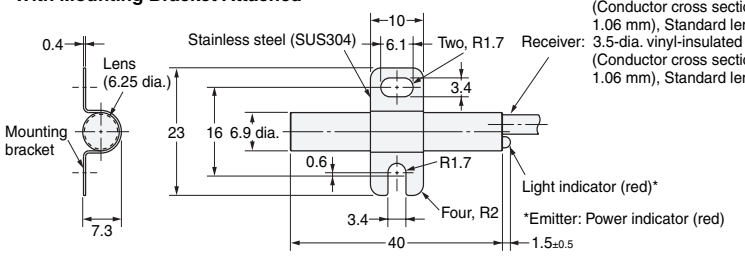
Note: Models numbers for Through-beam Sensors (E3H□-1E□) are for sets that include both the Emitter and Receiver.
Emitter model numbers are in the form E3H□-1L (e.g., E3HS-1L). Receiver model numbers are in the form E3H□-1DE□ (e.g., E3HS-1DE1). Refer to *Ordering Information* to confirm model numbers for Emitter and Receivers.

*

E3HC-1E□

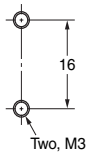


With Mounting Bracket Attached

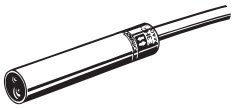


Emitter: 3.5-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.15 mm², Insulator diameter: 1.06 mm), Standard length: 2 m
Receiver: 3.5-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.15 mm², Insulator diameter: 1.06 mm), Standard length: 2 m

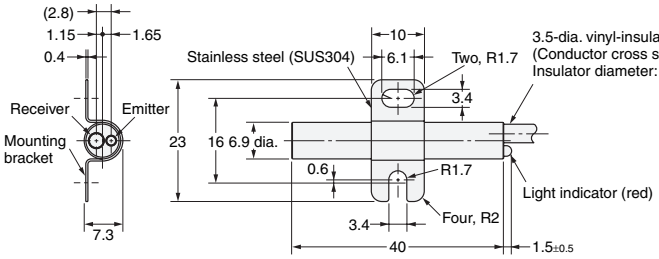
Mounting Holes



E3HC-DS3E□

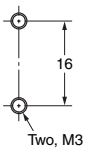


With Mounting Bracket Attached



3.5-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.15 mm², Insulator diameter: 1.06 mm), Standard length: 2 m

Mounting Holes

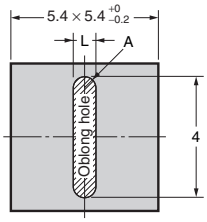


Note: Models numbers for Through-beam Sensors (E3HC-1E□) are for sets that include both the Emitter and Receiver.
The Emitter model number is E3HC-1L. Receiver model numbers are in the form E3HC-1DE□ (e.g., E3HC-1DE1). Refer to *Ordering Information* to confirm model numbers for Emitter and Receivers.

Accessories (Order Separately)

Seal-type Long Slit
(For E3HF-1E□)





Name	L (mm)	A (mm)
Slit (A)	0.5	0.25
Slit (B)	1	0.5
Slit (C)	2	1

Note: Slits are adhesive and pressure-sensitive.
Peel off the seal, and attach the slit to the lens surface.

Material: Polyester film
*Provided with the Through-beam E3HF-1E□

Mounting Brackets

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

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- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

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Disclaimers

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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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2010.9

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