E3C

CSM_E3C_DS_E_3_2

Thin, Compact Head Saves Space and Mounts Closely. Built-in Interference Protection Provided.

- Input indicator on the Sensor Unit simplifies settings.

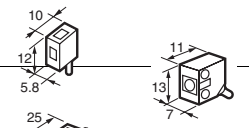
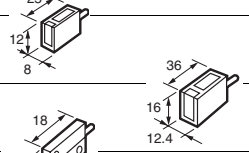
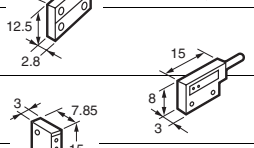
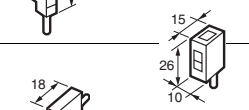
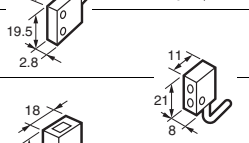
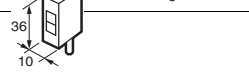
Be sure to read *Safety Precautions* on page 11.

Ordering Information

Sensors

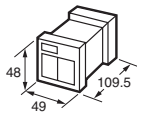
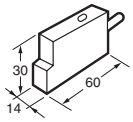
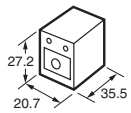
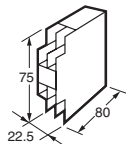
Sensor Units **[Refer to *Dimensions* on page 12.]**

Red light Infrared light

Sensing method	Application	Appearance	Sensing distance	Model
Through-beam (Emitter + Receiver) *	Small type		100 mm	**E3C-S10 2M**
			500 mm	**E3C-S50 2M**
			1 m	**E3C-1 2M**
			2 m	**E3C-2 2M**
	Slim type		200 mm	**E3C-S20W 2M**
			300 mm	**E3C-S30W 2M**
	Side-view			**E3C-S30T 2M**
Diffuse-reflective	Small type		100 mm	**E3C-DS10 2M**
	Slim type		50 mm	**E3C-DS5W 2M**
	Side-view		100 mm	**E3C-DS10T 2M**
Convergent-reflective	Small type		30±3 mm	**E3C-LS3R 2M**

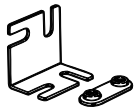
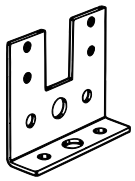
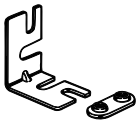
* The model number of the Emitter is expressed by adding an "L" right after the number of the set model number in the table.
Example: E3C-S10L 2M, E3C-1L 2M, E3C-S30LW 2M
The model number of the receiver is expressed by adding a "D" right after the number of the set model number in the table.
Example: E3C-S10D 2M, E3C-1D 2M, E3C-S30DW 2M
Order for individual emitters and receivers are accepted.

Amplifier Units [Refer to *Amplifier Units* on page 15.]

Power supply	Application	Appearance	Functions	Model
AC	Standard models		---	**E3C-A**
			Timer	**E3C-C**
DC	Slim type		Self diagnostic	**E3C-JC4P 2M**
	Small type		---	**E3C-GE4**
	Front terminal type			**E3C-WE4**
				E3C-WH4F

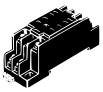
Accessories (Order Separately)

Mounting Brackets [Refer to *E39-L/F39-L/E39-S/E39-R* for Dimensions.]

Appearance	Model	Quantity	Remarks
	**E39-L41**	2	Provided with the E3C-1.
	E39-L42	2	Provided with the E3C-2. Can be used with the E3C-DS10.
	**E39-L127-T1**	1	Can be used with the E3C-S10.
	E39-L127-T2	1	
	E39-L127-T3	1	
	**E39-L31**	1*	Can be used with the E3C-S50.

Note: Refer to *E39-L/F39-F/E39-S/E39-R* for Dimensions.
* When using through-beam models, order one bracket for the Receiver and one for the Emitter.

Connector [Refer to *E39-L/F39-L/E39-S/E39-R* for Dimensions.]

Name	Appearance	Model	Quantity	Remarks
Front connection socket		**PF113A**	1	Provided with the E3C-A/C.
		**PYF08A**	1	Can be used with the E3C-GE4.
Rear connection socket		**PY08**	1	Can be used with the E3C-GE4.

Ratings and Specifications

Sensors

Item / Sensing method		Through-beam					
Model		E3C-S10	E3C-S20W	E3C-S50	E3C-S30T E3C-S30W	E3C-1	E3C-2
Sensing distance		100 mm	200 mm	500 mm	300 mm	1 m	2 m
Standard sensing object		Opaque, 2-mm dia. min.		Opaque, 3-mm dia. min.	Opaque, 1.5-mm dia. min.	Opaque, 4-mm dia. min.	Opaque, 8-mm dia. min.
Directional angle		Emitter/Receiver: 10 to 60° each		Emitter/Receiver: 10 to 40° each		Emitter/Receiver: 3 to 20° each	Emitter/Receiver: 3 to 15° each
Light source (wavelength)		Infrared LED (950 nm)			Infrared LED (940 nm)	Infrared LED (950 nm)	
Ambient illuminance (Receiver side)		Incandescent lamp: 3,000 lx max., Sunlight 10,000 lx max.					
Ambient temperature range		Operating/Storage: –25°C to 70°C (with no icing or condensation)					
Ambient humidity range		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 60529 IP64 Limited to indoor use	IEC 60529 IP50 Limited to indoor use	IEC 60529 IP64 Limited to indoor use	IEC 60529 IP60 Limited to indoor use	IEC 60529 IP66 Limited to indoor use	
Connection method		Pre-wired models (standard length: 2 m)					
Weight (packed state)		Approx. 50 g			Approx. 24 g	Approx. 60 g	Approx. 120 g
Material	Case	Polycarbonate		ABS	Polycarbonate		Zinc die-cast
	Lens	Polycarbonate		Acrylics	Polycarbonate		
	Mounting Brackets	---				Steel	
Accessories		Instruction manual	Phillips screw M2×8, spring washer, flat washer, M2 nut, instruction manual	Instruction manual	Phillips screw M2×8, spring washer, flat washer, nut M2, instruction manual	Mounting Bracket (with screws), instruction manual	Mounting Bracket (with screws), instruction manual

Item / Sensing method		Diffuse-reflective			Convergent-reflective
Model		E3C-DS5W	E3C-DS10T	E3C-DS10	E3C-LS3R
Sensing distance		50 mm (White paper 100 × 100 mm)	100 mm (White paper 100 × 100 mm)	100 mm (White paper 50 × 50 mm)	30 ± 3 mm (White paper 10 × 10 mm)
Differential travel		20% max. of sensing distance		10% max.	±3% max.
Light source (wavelength)		Infrared LED (950 nm)	Infrared LED (950 nm)		Red LED (680 nm)
Ambient illuminance (Receiver side)		Incandescent lamp: 3,000 lx max., Sunlight 10,000 lx max.			
Ambient temperature range		Operating/Storage: –25°C to 70°C (with no icing or condensation)			
Ambient humidity range		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 60529 IP50 (Limited to indoor use)		IEC 60529 IP64 (Limited to indoor use)	
Connection method		Pre-wired models (standard length: 2 m)			
Weight (packed state)		Approx. 50 g			Approx. 55 g
Material	Case	Polycarbonate			
	Lens	Polycarbonate			
Accessories		Phillips screw M2×8, spring washer, flat washer, M2 nut, instruction manual	Instruction manual		

Amplifier Units

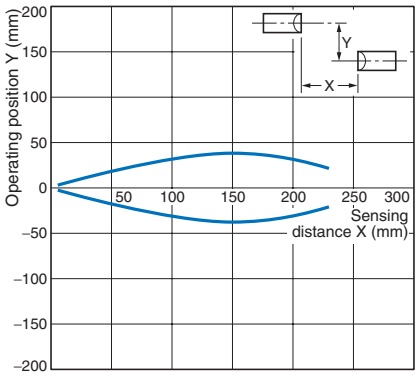
Item	Model	E3C-A	E3C-C	E3C-JC4P	E3C-GE4	E3C-WE4	E3C-WH4F
Power supply voltage		100 to 240 VAC±10%, 50/60 Hz		12 to 24 VDC±10%, ripple (p-p): 1 V max.			
Power (current) consumption		3 W max.		50 mA max.			
Control output	Transistor output	Load power supply voltage: 24 VDC max., load current: 80 mA max., voltage output type, output current: 1 to 4 mA (residual voltage: 1.2 V max.) Light-ON/Dark-ON switch selectable		Load power supply voltage: 24 VDC max., load current: 100 mA max., NPN open collector output type (residual voltage: 1 V max.) Light-ON/Dark-ON switch selectable	Load power supply voltage: 24 VDC max., load current: 80 mA max., voltage output type, output current: 1 to 4 mA (residual voltage: 0.7 V max.) Light-ON/Dark-ON switch selectable	Load power supply voltage: 24 VDC max., load current: 80 mA max., voltage output type, output current: 1 to 4 mA (residual voltage: 0.7 V max.) Light-ON/Dark-ON switch selectable	Load power supply voltage: 40 VDC max., load current: 100 mA max., NPN/PNP open collector output type (simultaneously usable) (residual voltage: 0.7 V max.) Light-ON/Dark-ON switch selectable
	Relay output	220 VAC 1 A cosϕ=1 (resistive load) SPDT contact only		---			
External synchronous input		---	H = 6 to 30 V L = 0 to 2 V When L, turns OFF the control output forcibly.	---			
Timer function		---	ON/OFF, oneshot delay (selectable): 1 or 10 s max.	OFF-delay 0/40 ms (switch selectable)	---		
Ambient temperature range		Operating: –10° to 55°C, Storage: –25° to 70°C (with no icing or condensation)					
Ambient humidity range		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: 300 ms^2 three times in each of X, Y and Z directions					
Degree of protection		IEC IP20 (limited to indoor use)		IEC IP60 (limited to indoor use)	IEC IP20 (limited to indoor use)		
Protection		Reverse polarity protection, output short-circuit protection, mutual interference prevention					
Response time	No contact	Operate or reset: 1 ms max./2 ms max. each (switch selectable)		Operate or reset: 1 ms max.	Operate or reset: 1 ms max./2 ms max. each (switch selectable)		
	Relay	Operate or reset: 20 ms max.		---			
Connection method		Terminal block		Terminal block input cable pullout (standard cable length: 2 m)	Terminal block		
Weight (packed state)		Approx. 200 g		Approx. 80 g	Approx. 15 g	Approx. 100 g	
Material	Case	ABS			Polycarbonate		
	Mounting Brackets	Stainless steel	---	Iron	---		
Accessories		Connection Socket (PF113A) Instruction manual		Mounting Bracket, Adjustment screwdriver, Caution label, Instruction manual	Instruction manual		Terminal Pin * (E99-C) Instruction manual

* The terminal pins are used for connection between amplifiers for synchronous operation.

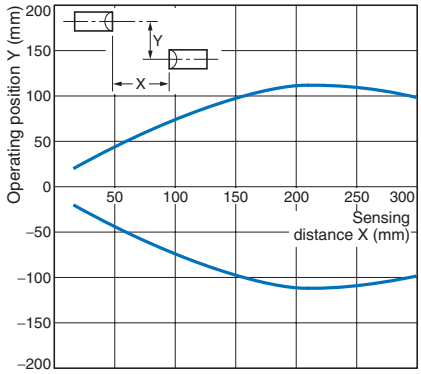
Engineering Data (Typical)

Parallel Operating Range

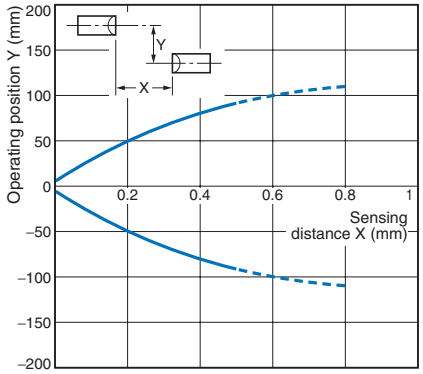
Through-beam
E3C-S10



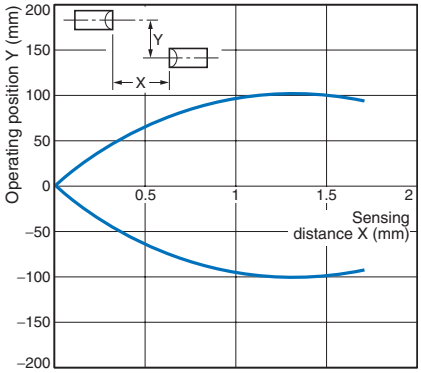
Through-beam
E3C-S20W



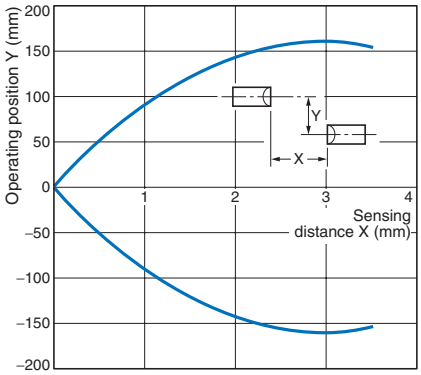
Through-beam
E3C-S50



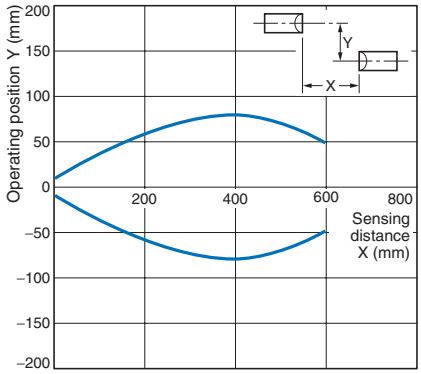
Through-beam
E3C-1



Through-beam
E3C-2

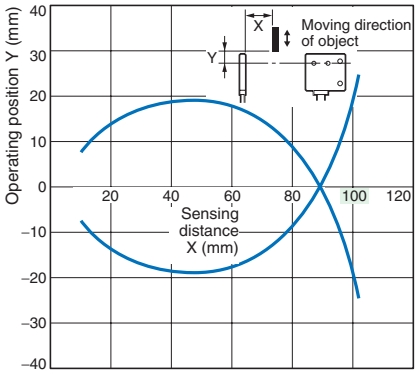


Through-beam
E3C-S30T/-S30W

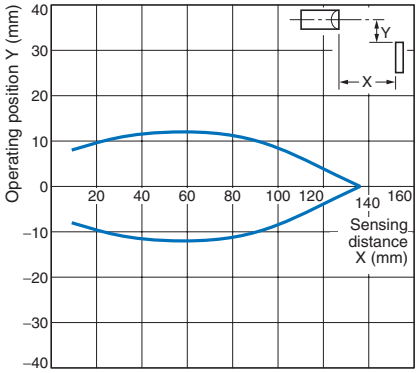


Operating Range

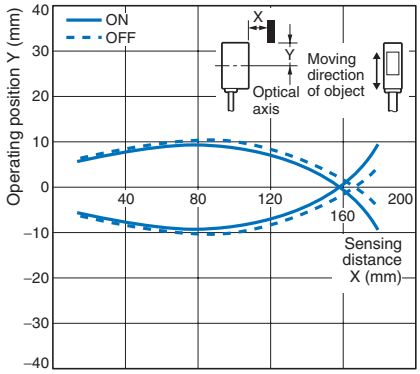
Diffuse-reflective
E3C-DS5W



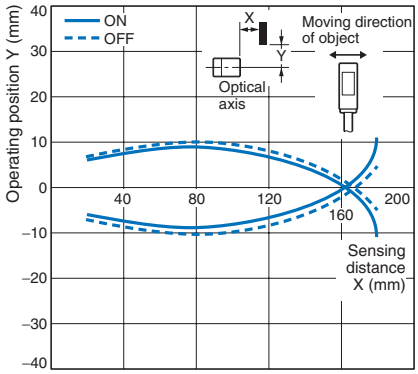
Diffuse-reflective
E3C-DS10T



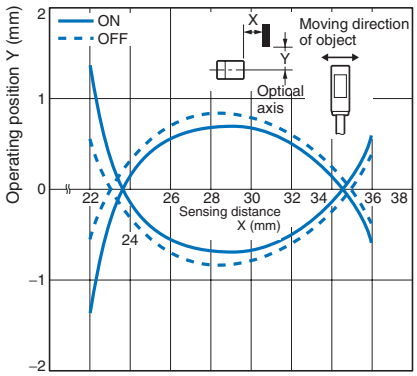
Diffuse-reflective
E3C-DS10 (Example 1)



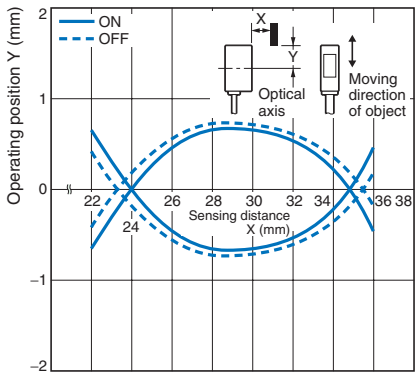
Diffuse-reflective
E3C-DS10 (Example 2)



Convergent-reflective
E3C-LS3R (Example 1)

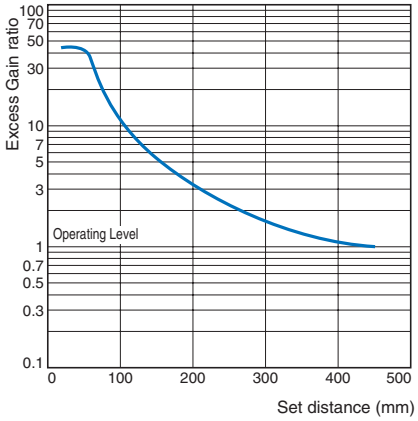


Convergent-reflective
E3C-LS3R (Example 2)

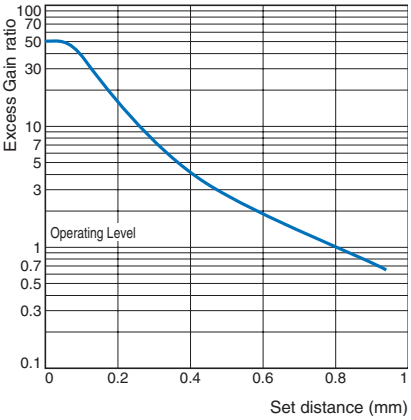


Excess Gain vs. Set Distance

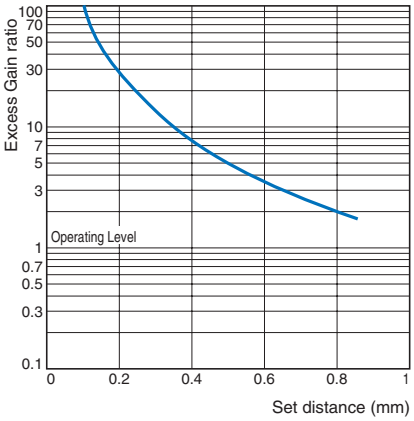
E3C-S20W



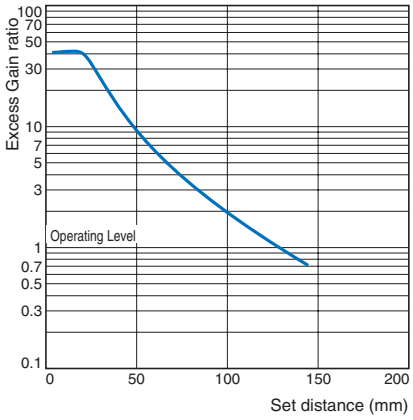
E3C-S30T/-S30W



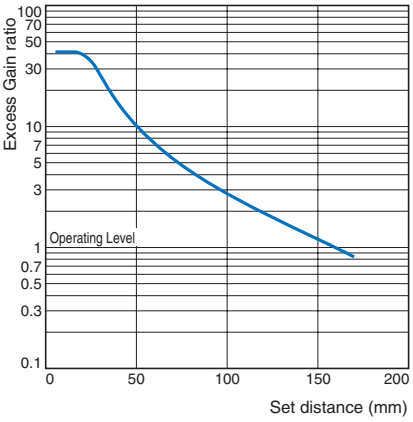
E3C-S50



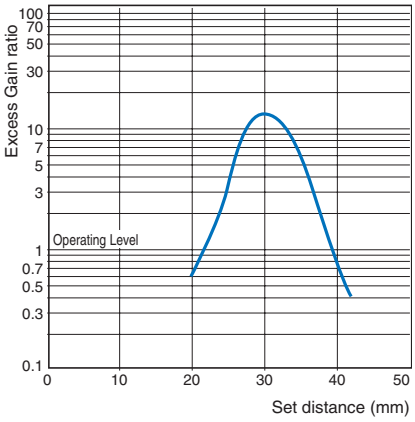
E3C-DS5W



E3C-DS10T

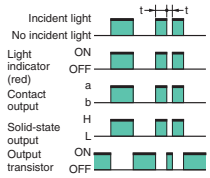
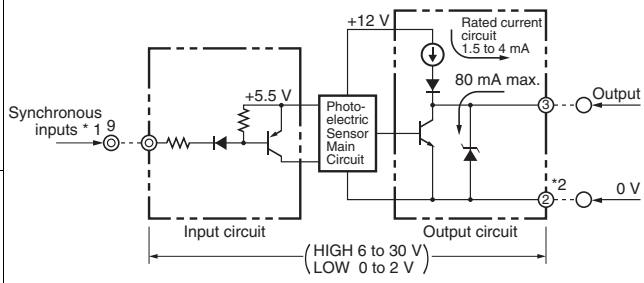
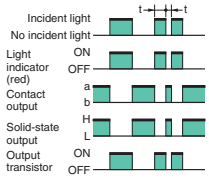
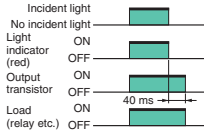
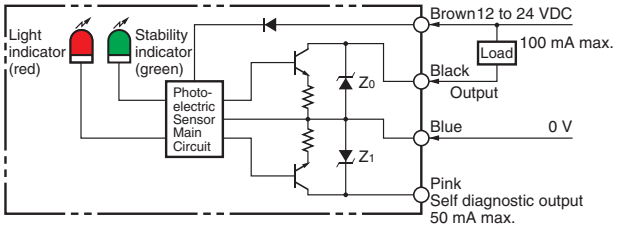
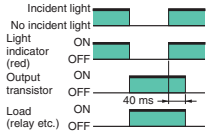
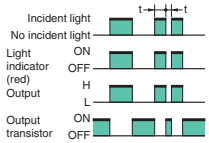
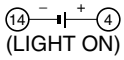
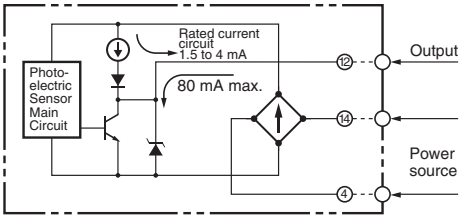
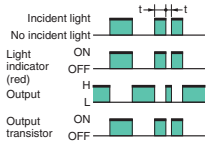
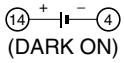
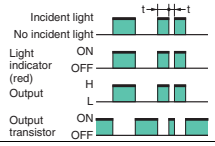
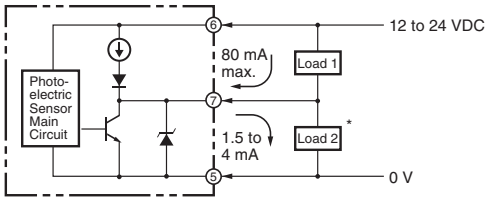
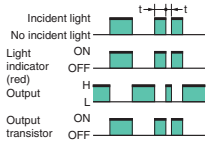


E3C-LS3R



I/O Circuit Diagrams

NPN output

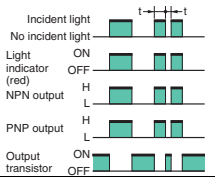
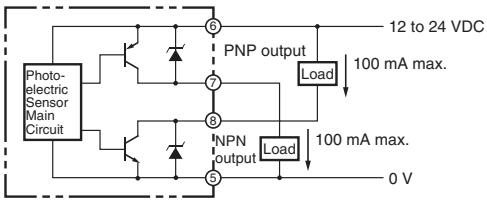
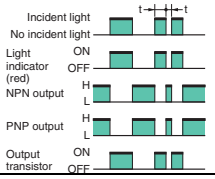
Model	Operation mode	Timing charts *	Operation selector	Output circuit
E3C-A E3C-C	Light-ON		LIGHT ON	
	Dark-ON		DARK ON	
E3C-JC4P	Light-ON		L-ON (LIGHT ON)	
	Dark-ON		D-ON (DARK ON)	
E3C-GE4	Light-ON		Switched with wiring.  (LIGHT ON)	
	Dark-ON		Switched with wiring.  (DARK ON)	
E3C-WE4	Light-ON		H1 (LIGHT ON)	
	Dark-ON		H2 (DARK ON)	

* 1. E3C-C only
* 2. E3C-A/-C have SPDT contact output.
(About terminal number, please refer to the connection section.)

* Voltage output (When connecting a transistor circuit, etc.)

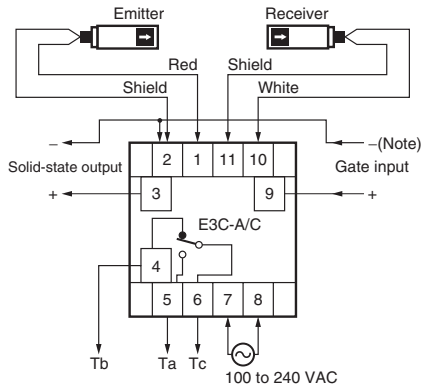
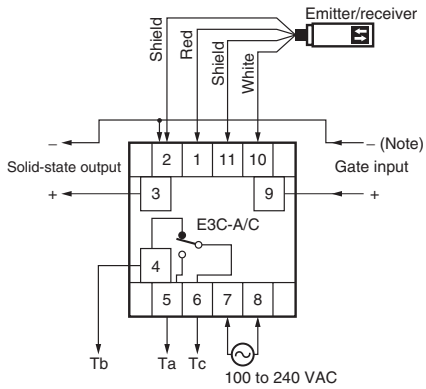
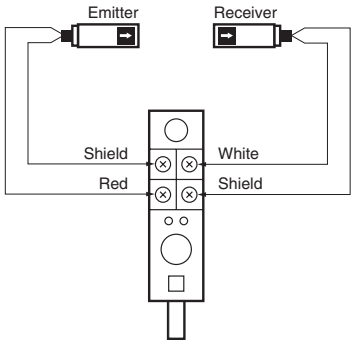
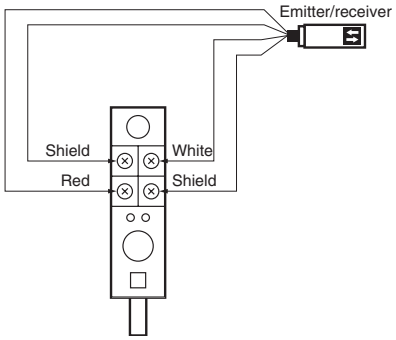
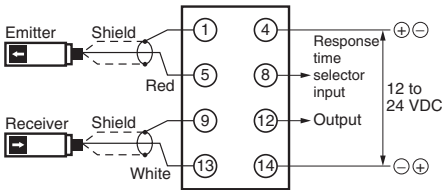
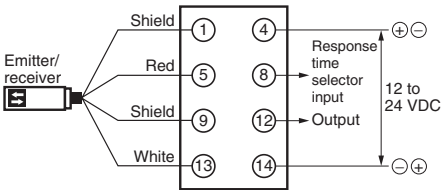
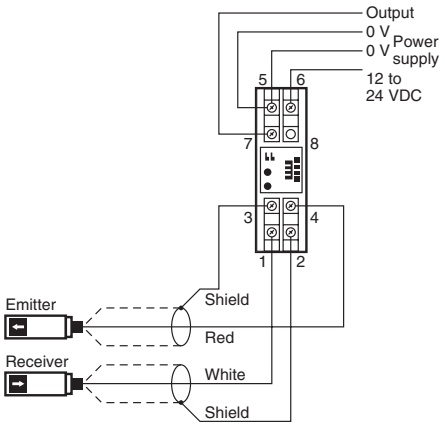
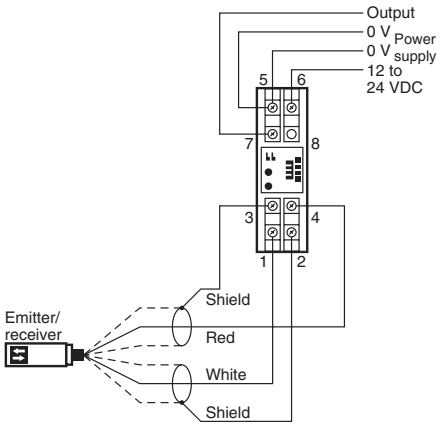
* For t in the timing chart, refer to *Part Names/Selection Method* on page 9.

NPN/PNP Output

Model	Operation mode	Timing charts *	Operation selector	Output circuit
E3C-WH4F	Light-ON		H1 (LIGHT ON)	
	Dark-ON		H2 (DARK ON)	

* For t in the timing chart, refer to *Part Names/Selection Method* on page 9.

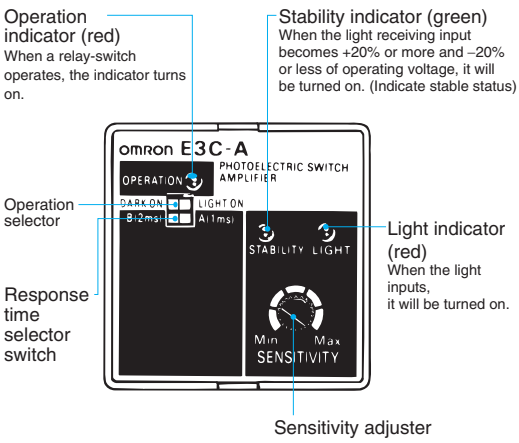
Connection

Amplifier Units	Connected to the through-beam model	Connected to the reflective model	Note
E3C-A/C + PF113A			Note: 1. The strip-off length of the shielded cable should always be 20 mm max. on the Receiver side (white) and 50 mm max. on the Emitter side (red). 2. The E3C-A does not have a gate input function. 3. L when the gate input 2-9 terminals are connected, H when they are disconnected.
E3C-JC4P			Note: 1. The strip-off length of the shielded cable should always be 20 mm max. on the Receiver side (white) and 50 mm max. on the Emitter side (red).
E3C-GE4			Note: 1. The strip-off length of the shielded cable should always be 20 mm max. on the Receiver side (white) and 50 mm max. on the Emitter side (red). 2. The response time is 1 ms when (8) is disconnected, and 2 ms when (8) is connected to 0 V (negative side) of the power supply. 3. By setting the power supply terminal (4) to – and (14) to +, the output turns "H" when the light is received. With the E2 mode, the output transistor turns OFF. By setting (4) to + and (14) to +, the output turns "L" when the light is received. With the E1 mode, the output transistor turns ON.
E3C-WE4			Note: 1. The strip-off length of the shielded cable should always be 20 mm max. on the Receiver side (white) and 50 mm max. on the Emitter side (red).

Nomenclature/Settings

Amplifier Units	Nomenclature	Settings

E3C-A



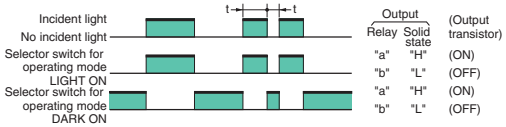
Operation switching

DARK ON ■ LIGHT ON	DARK turns the relay ON and the transistor output "H".
DARK ON ■ LIGHT ON	LIGHT turns the relay ON and the transistor output "H".

Response time changing (The different frequency type can be made up by changing the response speed.)

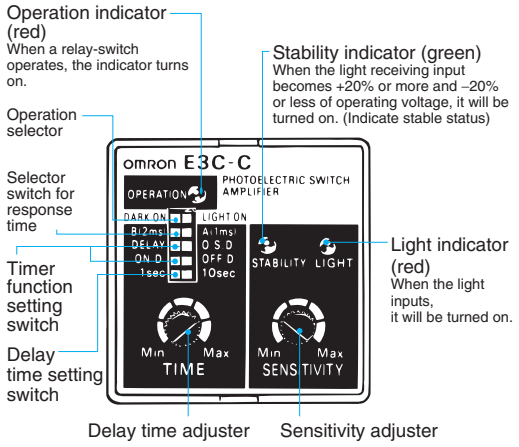
2 ms (B) ■ 1 ms (A)	The response time is set to 2 ms.
2 ms (B) ■ 1 ms (A)	The response time is set to 1 ms.

Timing chart



Note 1. Control output is produced only during input time.
2. When t exceeds 1 ms or 2 ms, solid-state output is produced. To produce relay output, t must be longer than 20 ms.

E3C-C



Operation switching

DARK ON ■ LIGHT ON	DARK turns the relay ON and the transistor output "H".
DARK ON ■ LIGHT ON	LIGHT turns the relay ON and the transistor output "H".

Response time changing (The different frequency type can be made up by changing the response speed.)

2 ms (B) ■ 1 ms (A)	The response time is set to 2 ms.
2 ms (B) ■ 1 ms (A)	The response time is set to 1 ms.

Delay time setting

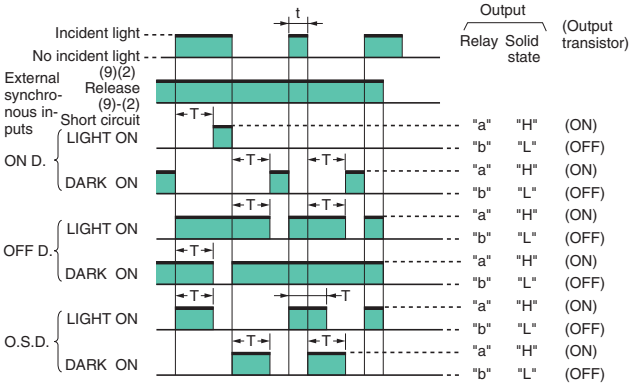
1 sec ■ 10 sec	0.1 to 1 s can be set.
1 sec ■ 10 sec	1 to 10 s can be set.

After setting the selector, fine-adjust the delay time with the variable adjuster. (Clockwise turn increases the delay time.)

Timer function setting

When selecting ON delay (ON D.)	DARK ON / LIGHT ON ←Set a position freely 2 ms (B) / 1 ms (A) ←Set a position freely DELAY / O.S.D. ON D. / OFF D. 1 sec / 10 sec ←Set a position freely
When selecting OFF delay (OFF D.)	DARK ON / LIGHT ON ←Set a position freely 2 ms (B) / 1 ms (A) ←Set a position freely DELAY / O.S.D. ON D. / OFF D. 1 sec / 10 sec ←Set a position freely
When selecting one-shot delay (O.S.D.)	DARK ON / LIGHT ON ←Set a position freely 2 ms (B) / 1 ms (A) ←Set a position freely DELAY / O.S.D. ON D. / OFF D. ←Since the function has stopped, it allows in both of the positions. 1 sec / 10 sec ←Set a position freely

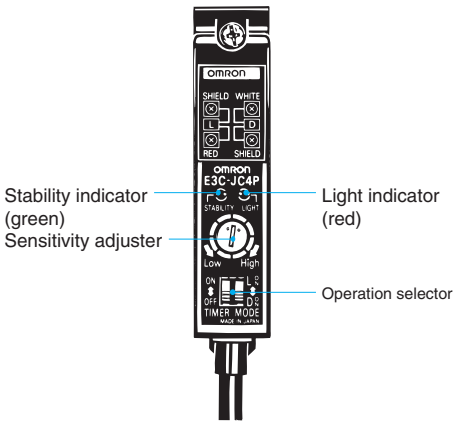
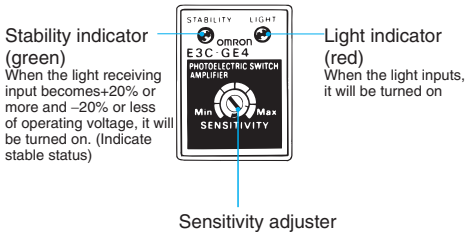
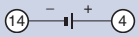
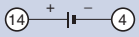
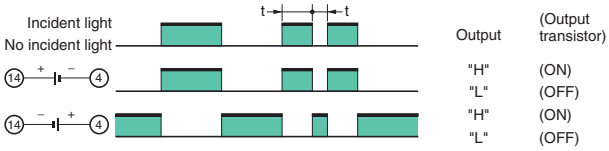
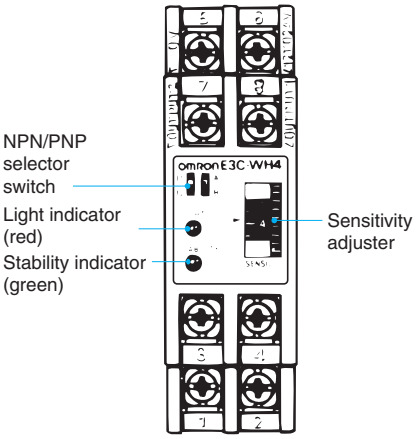
Timing chart



Note 1. t must be longer than 1 ms or 2 ms. 2. T denotes a delay time.

External synchronous input operation

When the external synchronous input terminal (9) is open (HIGH), the output relay performs timer operation according to the input signals (LIGHT, DARK). When the external synchronous input terminaL (9) is connected to the 0 V terminal (2) (LOW), the output relay turns OFF, independently of the input signals and output status, and acts as an inhibit signal.

Amplifier Units	Nomenclature	Settings
E3C-JC4P		---
E3C-GE4		**Operation switching**  DARK turns the output "H".  LIGHT turns the output "H". **Response time changing (The different frequency type can be made up by changing the response speed.)** **⑧-0 V * connected** — The response time is set to 2 ms. **⑧ disconnected** — The response time is set to 1 ms. * 0 V of power supply **Timing chart** 
E3C-WE4 E3C-WH4F		---

Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠ WARNING

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

Precautions for Correct Use

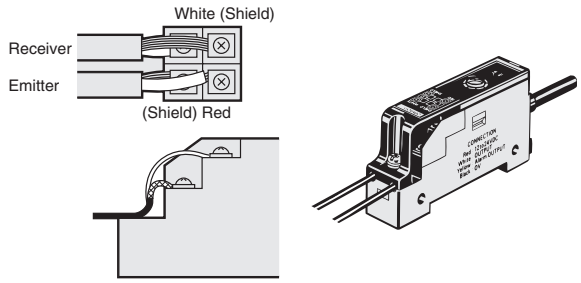
Do not use the product in atmospheres or environments that exceed product ratings.

Amplifier Units

● Wiring

Connection of E3C-JC4P Amplifier Unit and Sensor

Always run the shielded wires of the Emitter and Receiver separately. Also, route the sensor cable along the cable grooves of the cover and sensor and fix it with the cover.



Connection Socket

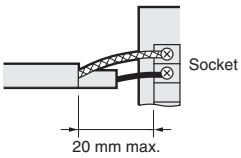
The standard socket is the PF113A for the E3C-A and -C, and the PYF08A, PYF08M or PY08 for the E3C-GE4. Avoid using any other sockets since they may not satisfy the characteristics. (There will be no problem when the STABILITY indicator turns ON)

Sensor Units

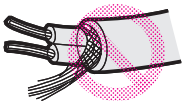
● Wiring

Extension Cable

- The extension distance of the sensor connection cable should be within 10 m.
- The strip-off length of the core in the connection cable should be 20 mm max. on the Receiver side and 50 mm max. on the Emitter side, and the core should be as short as possible. Avoid using the joint terminal and connector.

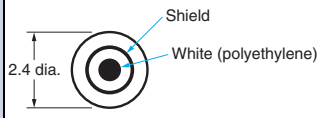
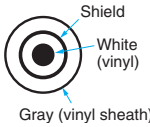
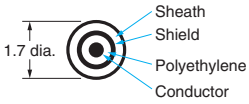
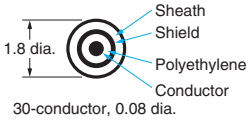


- Use independent shielded wires for the Emitter and Receiver. Using a common shielded wire can cause a malfunction.

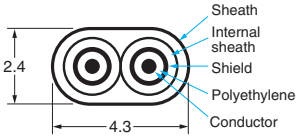
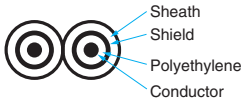


Extension Cable

Through-beam

Cable / Model	Specified cable	Replacement cable
E3C-S10 **E3C-1** **E3C-2** **E3C-S50**	Polyethylene insulation shield Round cable  12-conductor, 0.18 dia.	1-conductor shield/ vinyl wire, conductor cross section: 0.3 mm² min. 
E3C-S20W	Vinyl insulation shield round cable  12-conductor, 0.18 dia.	1-conductor shield/ vinyl wire, conductor cross section: 0.3 mm² min.
E3C-S30T **E3C-S30W**	Vinyl insulation shield round cable (robot cable)  30-conductor, 0.08 dia.	

Reflective model

Cable / Model	Specified cable	Replacement cable
E3C-DS10 **E3C-DS10T** **E3C-VS1G** **E3C-VS3R** **E3C-LS3R**	Vinyl insulation shielded parallel cable  12-conductor, 0.18 dia.	When there is no1-conductor shielded, vinyl cable (parallel wire), use two 1-conductor shielded, vinyl wires.
E3C-DS5W **E3C-VS7R** **E3C-VM35R**	Vinyl insulation shielded parallel cable  7-conductor, 0.18 dia.	When there is no1-conductor shielded, vinyl cable (parallel wire), use two 1-conductor shielded, vinyl wires.

● Others

When the E3C is used in a place where high-frequency noise will be generated, e.g. ultrasonic welder, grounding the 0-V terminal (on the shield side of the connection cable) of the Receiver may avoid a malfunction caused by induction.

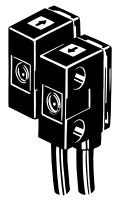
Dimensions

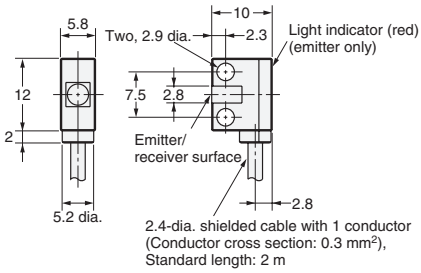
(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

Sensors

Sensor Units

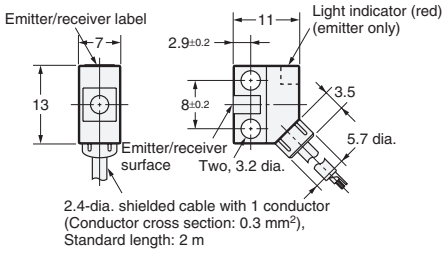
E3C-S10





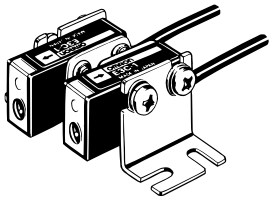
Emitter:	E3C-S10L
Receiver:	E3C-S10D

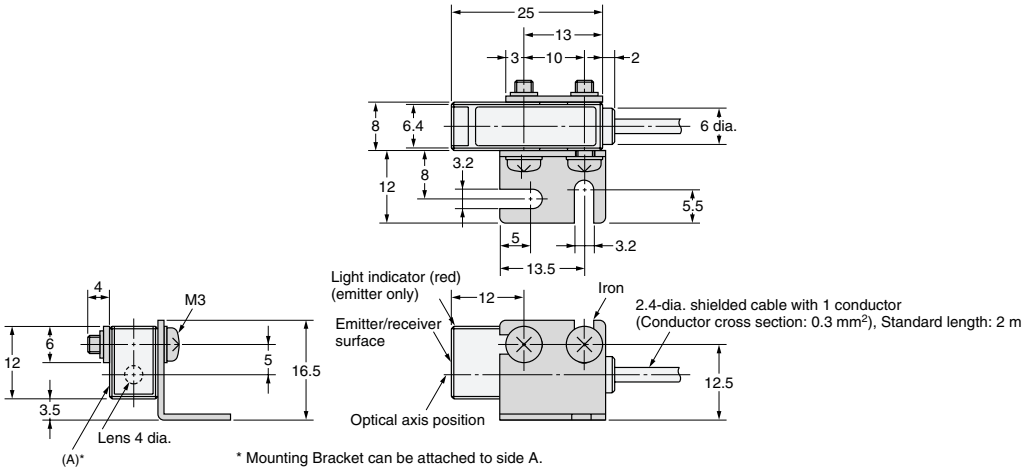
E3C-S50



Emitter:	E3C-S50L
Receiver:	E3C-S50D

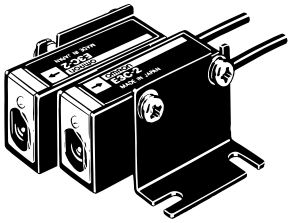
E3C-1

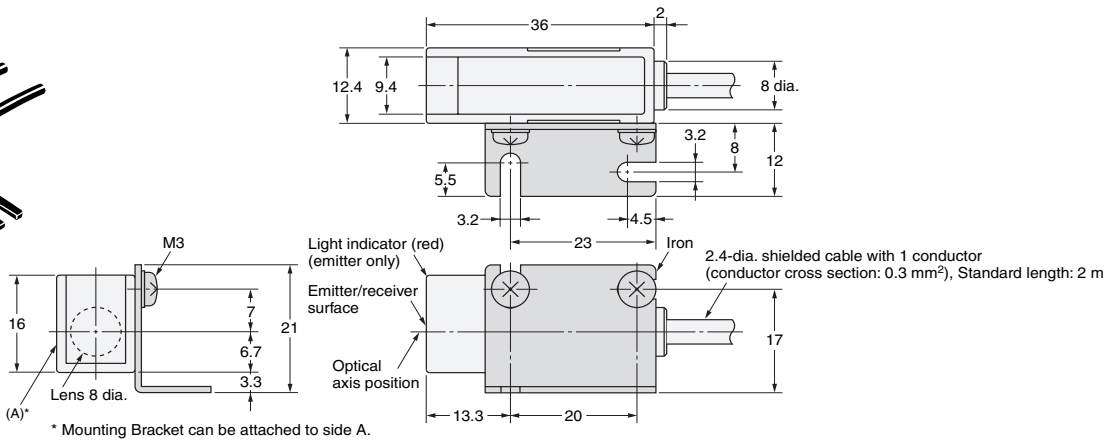




Emitter:	E3C-1L
Receiver:	E3C-1D

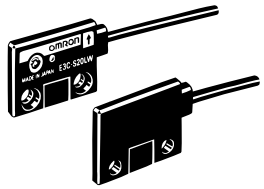
E3C-2

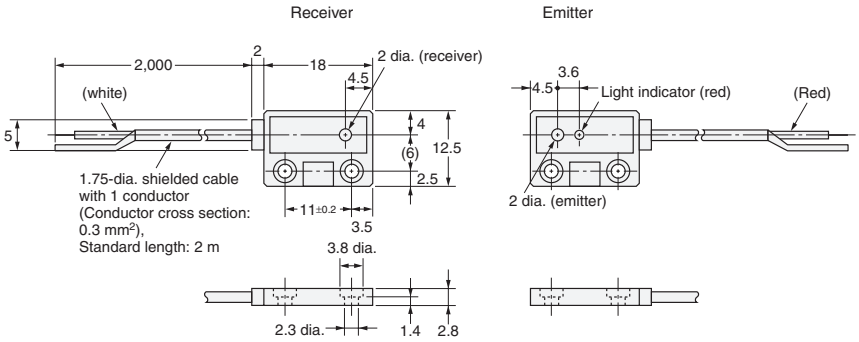




Emitter:	E3C-2L
Receiver:	E3C-2D

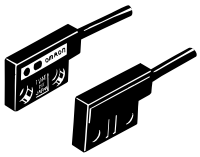
E3C-S20W

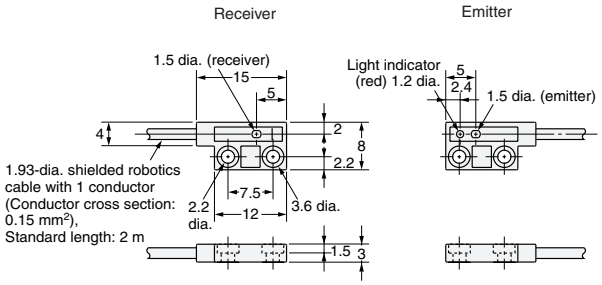




Emitter:	E3C-S20LW
Receiver:	E3C-S20DW

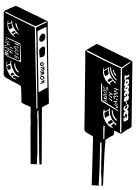
E3C-S30W

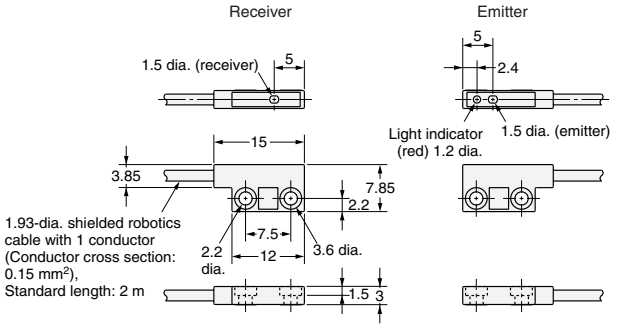




Emitter:	E3C-S30LW
Receiver:	E3C-S30DW

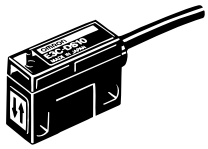
E3C-S30T

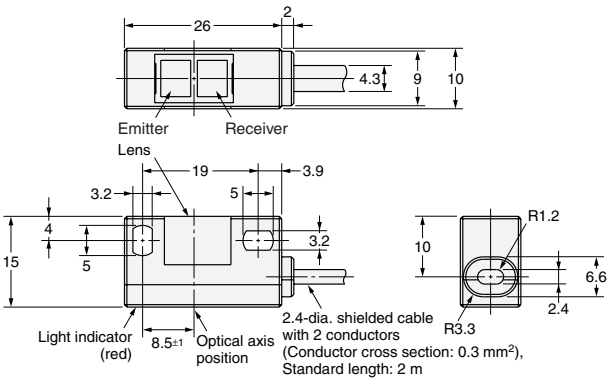




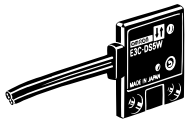
Emitter:	E3C-S30LT
Receiver:	E3C-S30DT

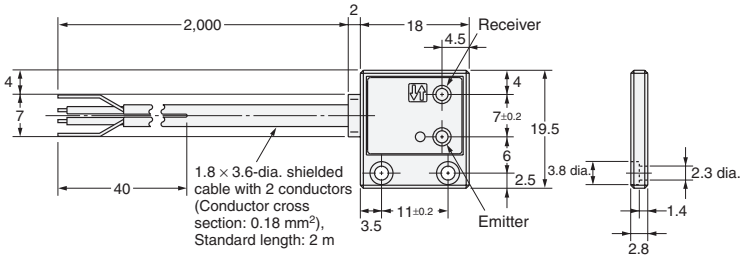
E3C-DS10



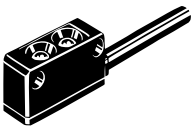


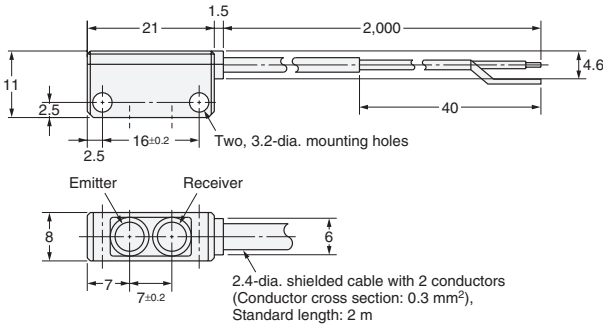
E3C-DS5W



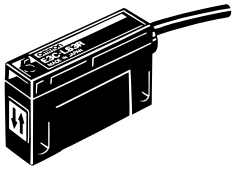


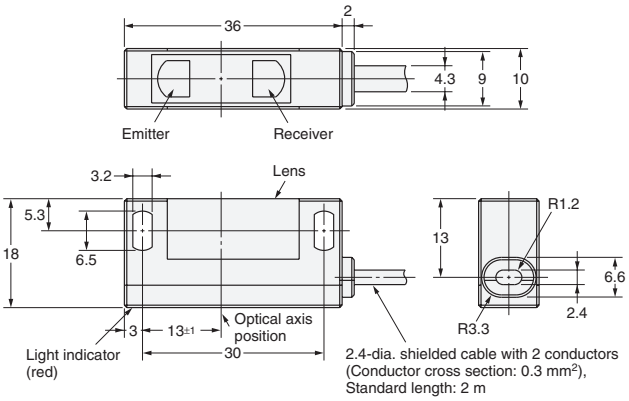
E3C-DS10T





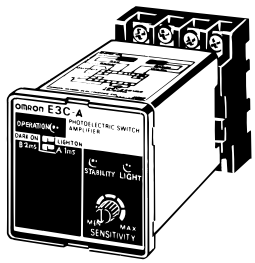
E3C-LS3R

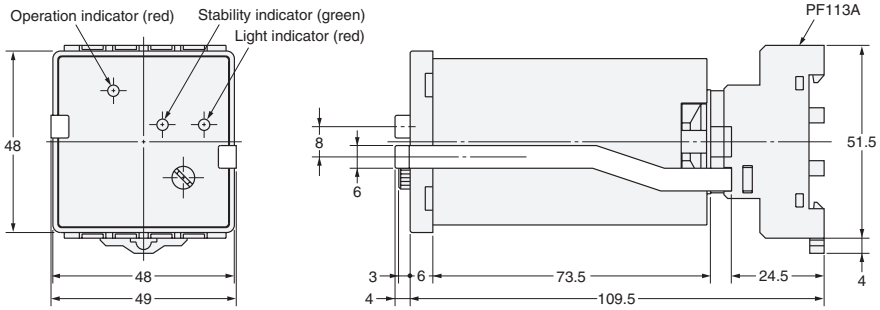




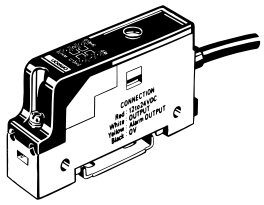
Amplifier Units

E3C-A
E3C-C

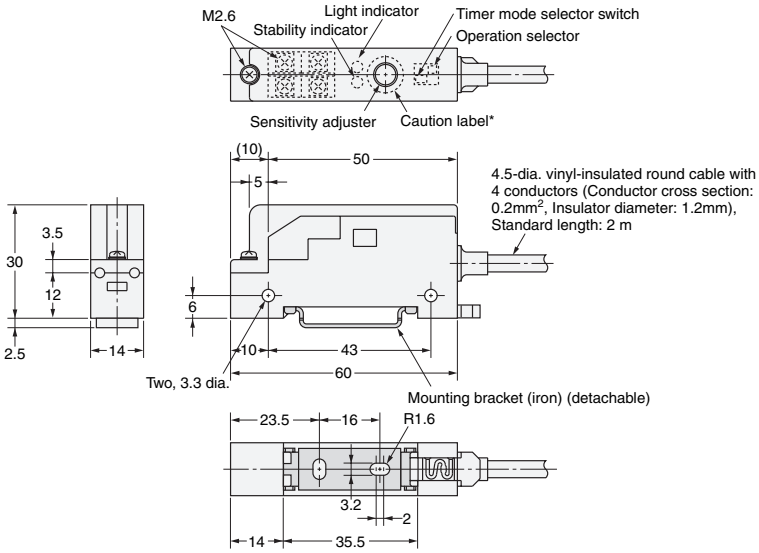




E3C-JC4P

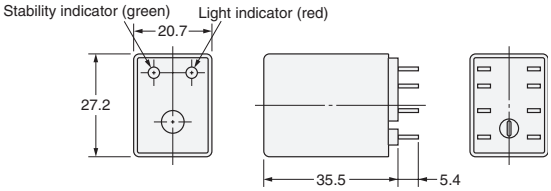


With Mounting Bracket Attached



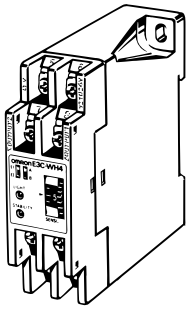
*After adjusting the sensitivity, attach the caution label at the location indicated by ◌ above to prevent malfunction.

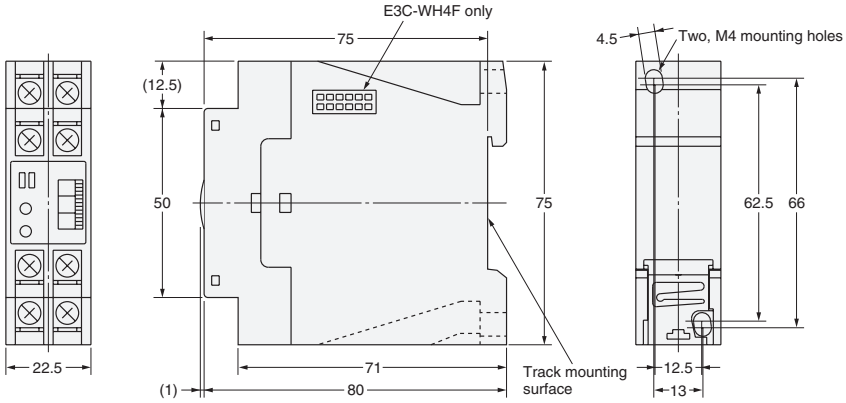
E3C-GE4



Connector
Use the PYF08A front connection socket or PY08 rear connection socket.

E3C-WE4
E3C-WH4F





Accessories (Order Separately)

Mounting Brackets

Refer to *E39-L/F39-L/E39-S/E39-R* for details.

Connecting Sockets

Refer to *E39-L/F39-L/E39-S/E39-R* for details.

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2009.1

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Industrial Automation Company

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