

Special-Purpose Photoelectric Sensors

E3C

Miniature Sensors with Separate Amplifiers Fit Tight Spaces

- Fast, 1 ms response time
- Light incident indicator on sensor
- Dust-resistant flat lens surface
- New, thin side view model
- Prewired sensors have 2 m (6.56 ft) cable
- Amplifier with built-in ON-, OFF- and one-shot delays available
- New prewired DC amplifier designed for track mounting has alarm output to signal unstable sensing conditions



Ordering Information

■ SENSORS

Through-beam Type

Shape							
Sensing distance	10 cm (3.94 in)	20 cm (7.87 in)	30 cm (11.81 in)		50 cm (19.69 in)	1 m (3.28 ft)	2 m (6.56 ft)
Part number	E3C-S10	E3C-S20W	E3C-S30W	E3C-S30T	E3C-S50	E3C-1	E3C-2

Diffuse Reflective Type

Shape		
Sensing distance	5 cm (1.97 in)	10 cm (3.94 in)
Part number	E3C-DS5W	E3C-DS10

■ AMPLIFIERS

Shape	 Fits 1/16 DIN panel cutout		 For S3D8 controller	 Miniature		 Slim, prewired	
Supply voltage	100 to 240 VAC, 50/60 Hz		12 to 24 VDC				
Output	Relay and NPN solid-state		NPN and PNP solid-state	NPN solid-state	PNP solid-state	NPN	PNP
Timer functions	—	ON-delay OFF-delay One-shot	—	—		40 ms OFF-delay	
Mounting style	Socket (included)		Track	Socket Track (order separately)			
Part number	E3C-A	E3C-C	E3C-WH4F	E3C-GE4	E3C-GF4	E3C-JC4P	E3C-JB4P

■ ACCESSORIES

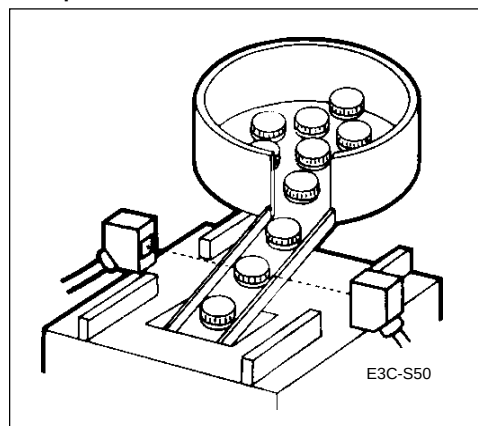
Description		Part number
Mounting brackets	U-shaped, for E3C-S10, with 10 mm (0.394 in) sensing distance gap	OAC-T1
	U-shaped, for E3C-S10, with 20 mm (0.787 in) sensing distance gap	OAC-T2
	U-shaped, for E3C-S10, with 30 mm (1.181 in) sensing distance gap	OAC-T3
	L-shaped, for E3C-DS10	E39-L42
	L-shaped, for E3C-S50	E39-L31
Sockets required for E3C-G□4 amplifier	Bottom surface mount socket	PYF08M
	Combination bottom surface and track-mount socket	PYF08A-E
Mounting track	DIN rail, 50 cm (1.64 ft) length	PFP-50N
	DIN rail, 1 m (3.28 ft) length	PFP-100N
	End plate	PFP-M
	Spacer	PFP-S

■ REPLACEMENT PARTS

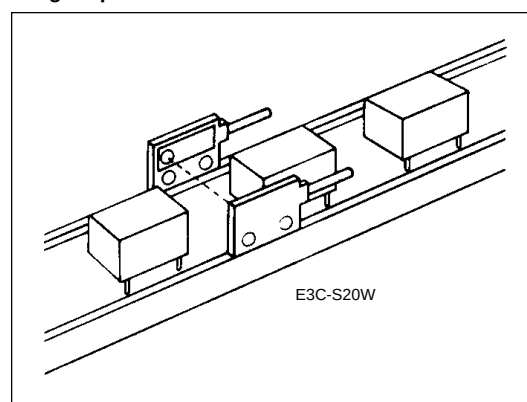
Description		Part number
Track-mount socket for E3C-A and E3C-C amplifiers		PF113A-E
Mounting bracket for E3C-1		E39-L41
Mounting bracket for E3C-2		E39-L42
Mounting bracket for E3C-J□4P		E39-L48

■ TYPICAL APPLICATIONS

Detect parts coming from a bowl feeder in a space-confined location



Space-saving flat sensors can detect small parts in tight spaces



Specifications

■ THROUGH-BEAM TYPE

Part number		E3C-S10	E3C-S20W	E3C-S30□	E3C-S50	E3C-1	E3C-2
Sensing distance		10 cm (3.94 in)	20 cm (7.87 in)	50 cm (1.64 ft)		1 m (3.28 ft)	2 m (3.28 ft)
Light source		Pulse modulated infrared LED					
Detectable object	Type	Opaque materials					
	Size	2 mm (0.08 in) min. dimension	2 mm (0.09 in) min. dimension	3 mm (1.18 in) min. dimension		4 mm (0.16 in) min. dimension	8 mm (0.32 in) min. dimension
Required amplifier		E3C-A, E3C-C, E3C-GE4, E3C-GF4, E3C-JC4P, E3C-JB4P, E3C-WH4F					
Indicators	Emitter	Light Incident (red LED)					
	Receiver	None					
Materials	Lens	Plastic, polycarbonate					
	Case	Plastic, polycarbonate					Zinc die-cast
	Cable sheath	Plastic, polyethylene					
Mounting		Side surface with two through holes. Brackets OAC-T1, OAC-T2, OAC-T3 optional, see Accessories	Side surface with two through holes.	Side surface with two through holes. Bracket E39-L31 optional, see Accessories		Side surface with two through holes. Bracket E39-L41 and hardware included.	Side surface with two through holes. Bracket E39-L42 and hardware included.
Connections	Prewired	Emitter: 2-conductor cable, 2 m (6.56 ft) length Receiver: 2-conductor cable, 2 m (6.56 ft) length					
Weight	Emitter	25 g (0.9 oz.)				30 g (1.1 oz.)	60 g (2.2 oz.)
	Receiver	25 g (0.9 oz.)				30 g (1.1 oz.)	60 g (2.2 oz.)
Enclosure ratings	UL	—					
	NEMA	1, 2, 12	1	1	1, 2, 12	1, 2, 4, 4X, 12	
	IEC 144	IP64	IP50	IP60	IP64	IP66	
Approvals	UL	—					
	CSA	—					
Ambient temperature	Operating	-25° to 70°C (-13° to 158°F)					
	Storage	-25° to 70°C (-13° to 158°F)					

■ DIFFUSE REFLECTIVE TYPE

Part number	E3C-DS5W			E3C-DS10
Sensing distance	5 cm (1.97 in) with 10 X 10 cm (3.94 in) 90% reflectance white mat paper			10 cm (3.94 in) with 5 X 5 cm (1.97 in) 90% reflectance white mat paper
Detectable object type	Opaque and transparent materials			
Required amplifier	E3C-A, E3C-C, E3C-GE4, E3C-GF4, E3C-JC4P, E3C-JB4P, E3C-WH4F			
Indicators	Light Incident (red LED)			
Materials	Lens	Plastic, polycarbonate		
	Case	Plastic, polycarbonate		
	Cable sheath	Plastic, polyethylene		
Mounting		Side surface with two through holes.		Side surface with two through holes. Bracket E39-L42 optional, see Accessories.
Connections	Prewired	4-conductor cable, 2 m (6.56 ft) length		
Weight		50 g (1.8 oz.)		
Enclosure ratings	UL	—		
	NEMA	1		1, 2, 12
	IEC 144	IP50		IP64
Approvals	UL	—		
	CSA	—		
Ambient temperature	Operating	-25° to 70°C (-13° to 158°F)		
	Storage	-25° to 70°C (-13° to 158°F)		

■ AMPLIFIERS

AC Powered

Part number			E3C-A	E3C-C
Supply voltage			100 to 240 VAC, 50/60 Hz	
Power consumption			3 VA max.	
Operation mode			Light-ON/Dark-ON, switch selectable	
Sensitivity			Adjustable	
Control output	Relay	Type	SPDT	
		Max. load	1 A, 240 VAC (p.f. = 1)	
		Min. load	1 mA, 5 VDC	
	DC solid-state	Type	NPN-SPST with constant current source	
		Max. load	Load (relay, sink) logic, 80 mA, 24 VDC Voltage logic (source): 1.5 to 4 mA	
		Max. on-state voltage drop	1.0 VDC	
Response time	ON	Solid-state	1 ms or 2 ms max., switch selectable	
		Contact	20 ms max.	
	OFF	Solid-state	1 ms or 2 ms max., switch selectable	
		Contact	20 ms max.	
Timer functions		Type	—	ON-delay, OFF-delay, one-shot, switch selectable
		Range	—	0.1 to 1 second or 1 to 10 seconds, switch selectable
Circuit protection		Output short-circuit	Not available	
Indicators			Light Incident (red LED), Output Stability (green LED), Output Operation (red LED)	
Materials		Case	Plastic	
Mounting			Requires PF113A-E socket (included); socket mount to DIN rail track	
Connections			Terminal screws on socket	
Weight			220 g (7.8 oz.), including socket	
Enclosure ratings	UL		—	
	NEMA		1	
	IEC144		IP20	
Approvals	UL		—	
	CSA		—	
Ambient temperature	Operating		-10° to 55°C (14° to 131°F)	
	Storage		-25° to 70°C (-13° to 158°F)	

DC Powered

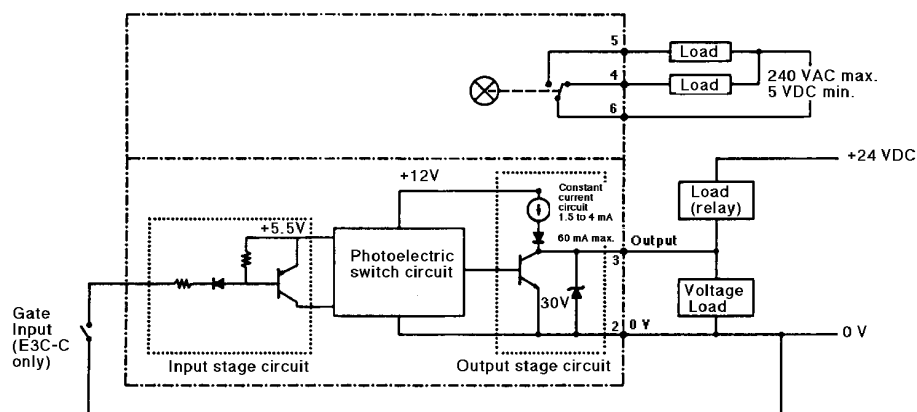
Part number			E3C-JB4P	E3C-JC4P	E3C-GE4	E3C-GF4	E3C-WH4F
Supply voltage			12 to 24 VDC ±10%; 1 V max. permissible ripple peak-to-peak				
Current consumption			50 mA				
Operation mode			Light-ON/Dark-ON switch selectable		Light-ON/Dark-ON, jumper selectable		Light-ON/Dark-ON switch selectable
Sensitivity			Adjustable				
Control output	DC solid-state	Type	PNP output	NPN output	NPN output with constant current source	PNP output	NPN and PNP open collector outputs
		Max. load	100 mA max. 24 VDC	100 mA max. 24 VDC	Load (relay, sink) logic: 80 mA, 24 VDC Voltage logic (source): 1.5 to 4 mA	100 mA max. 24 VDC	100 mA, 40 VDC (each output)
		Max. on-state voltage drop	0.7 VDC	0.7 VDC	1.2 VDC		0.7 VDC
Alarm output		Type	PNP	NPN	—		
		Max. load	50 mA, 24 VDC	50 mA, 24 VDC	—		
Response time		ON	1 ms		1 ms or 2 ms max., selectable		1 ms or 2 ms max. switch selectable
		OFF	1 ms or 40 ms, selectable		1 ms or 2 ms max., selectable		1 ms or 2 ms max. switch selectable
Circuit protection		Output short-circuit	Yes		Yes		Yes
		DC power supply reverse polarity	Yes		Yes		Yes

DC Amplifiers, continued

Part number		E3C-JB4P	E3C-JC4P	E3C-GE4	E3C-GF4	E3C-WH4F
Indicators		Light Incident (red LED), Output Stability (green LED)				
Materials	Case	Plastic				
Mounting		DIN rail track or mounting bracket E39-L48 (included) or side surface with two through holes		Requires PYF08A-E or PYF08M socket (not included). Order separately from Accessories.		DIN rail track or bottom surface with two through holes.
Connections		Prewired with 5 conductor cable, 2 m (6.56 ft) length		Terminal screws on socket		Terminal screws or direct connection to S3D8 Sensor Controller with E99-C connector (included).
Weight		80 g (2.8 oz.)		15 g (0.5 oz.)		100 g (3.5 oz.)
Enclosure	UL	—		—		
	NEMA	1, 2		1		
	IEC 144	IP50		IP20		
Approvals	UL	—				
	CSA	—				
Ambient temperature	Operating	-10° to 55°C (14° to 131°F)				
	Storage	-25° to 70°C (-13° to 158°F)				

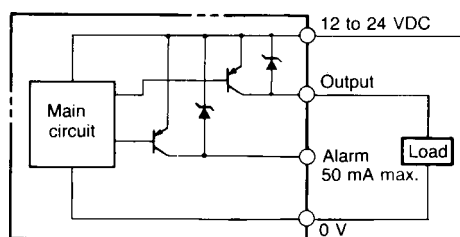
OUTPUT CIRCUIT DIAGRAMS

Amplifiers E3C-A, E3C-C

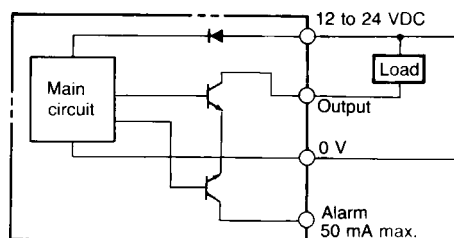


Amplifiers E3C-J□4P

PNP output type E3C-JB4P

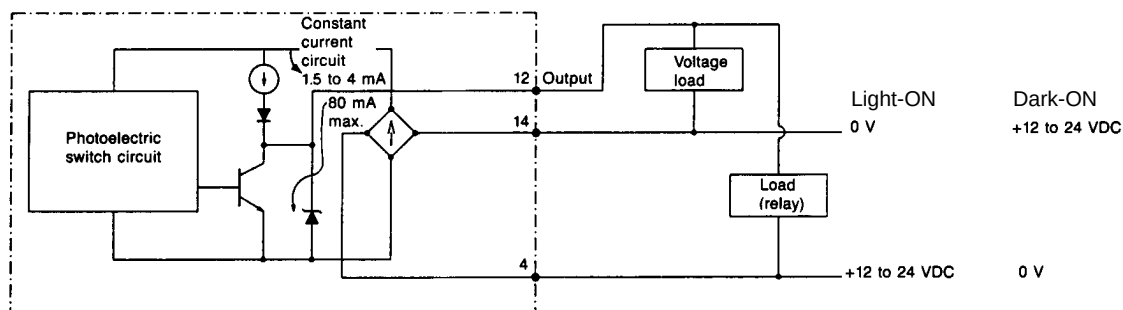


NPN output type E3C-JC4P

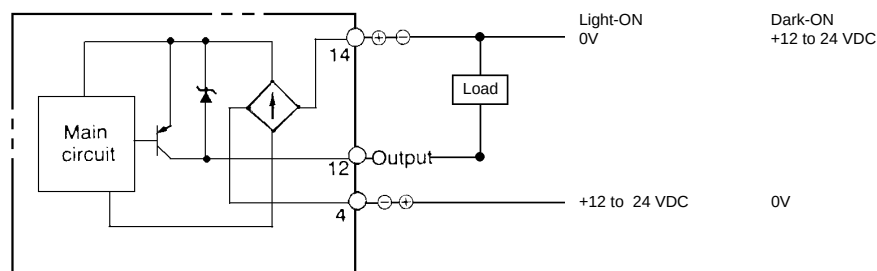


OUTPUT CIRCUIT DIAGRAMS, continued

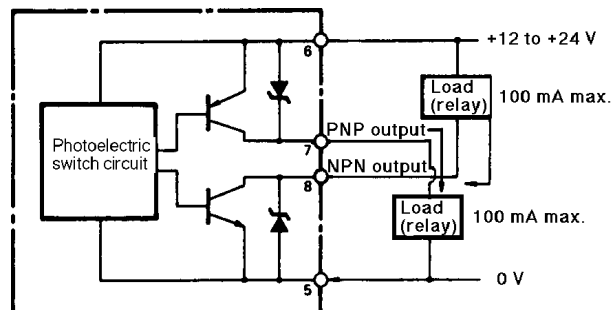
Amplifier E3C-GE4



PNP Output E3C-GF4



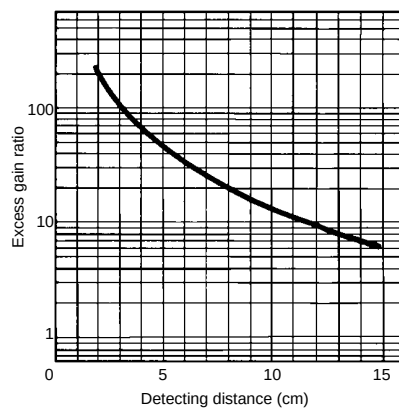
Amplifier E3C-WH4F



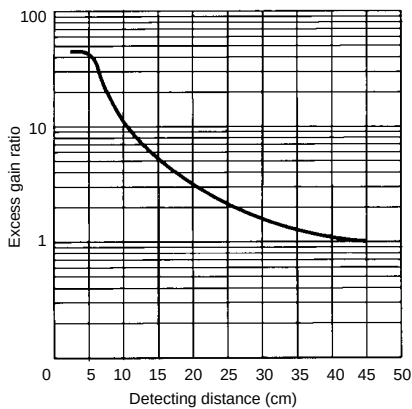
Engineering Data

■ EXCESS GAIN RATIO

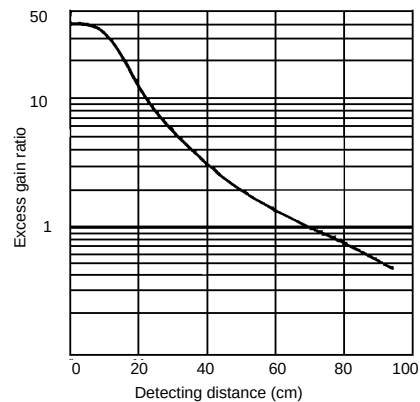
E3C-S10



E3C-S20W

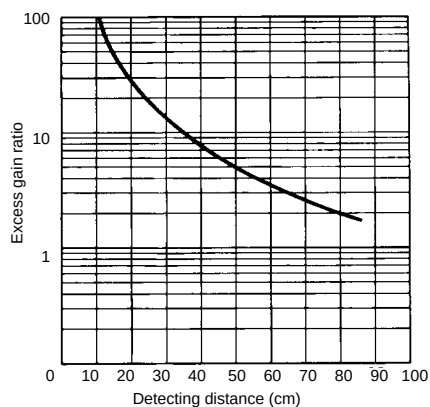


E3C-S30T, E3C-S30W

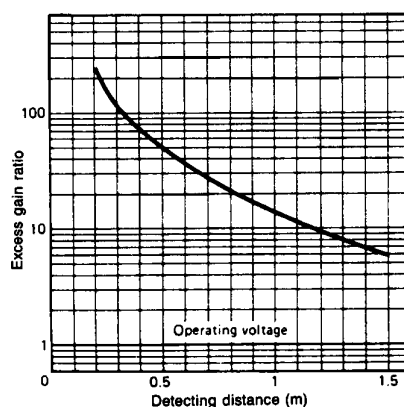


EXCESS GAIN RATIO, continued

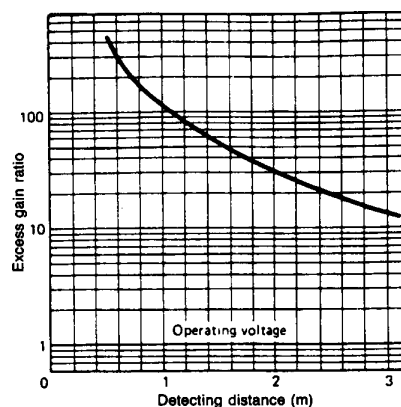
E3C-S50



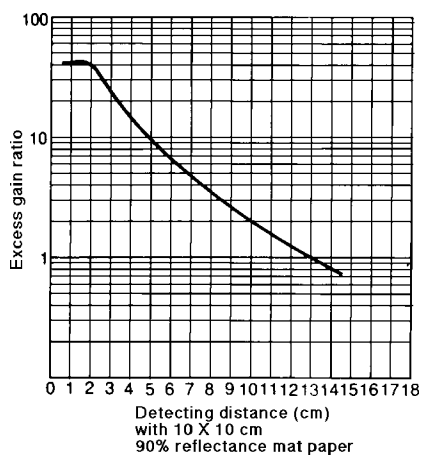
E3C-1



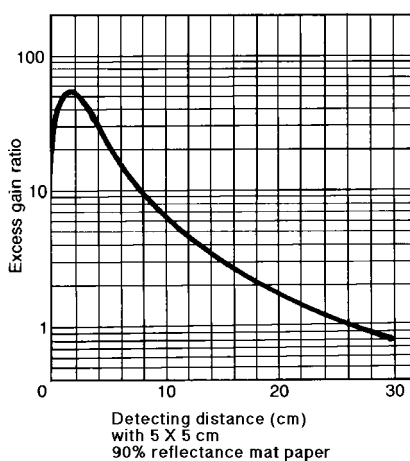
E3C-2



E3C-DS5W



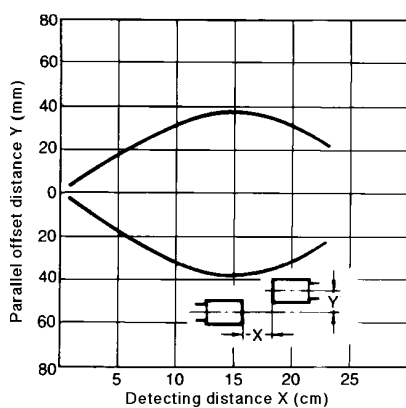
E3C-DS10



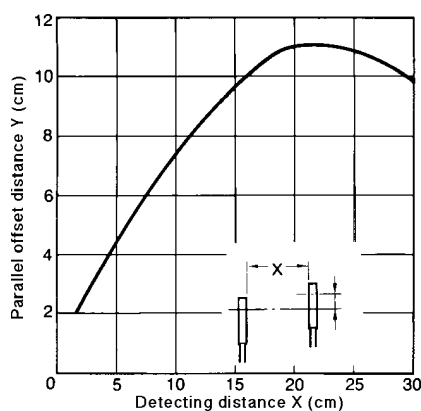
■ LIGHT SOURCE/RECEIVER SETTING RANGE

Separate type

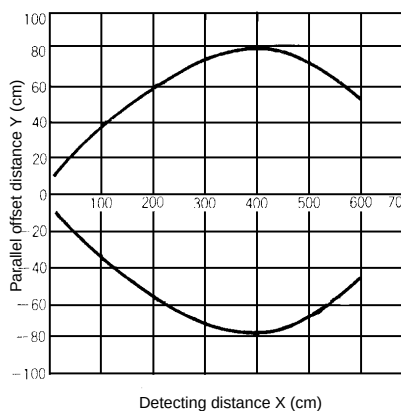
E3C-S10



E3C-S20W

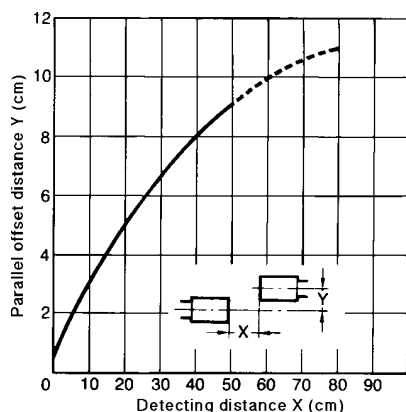


E3C-S30T, E3C-S30W

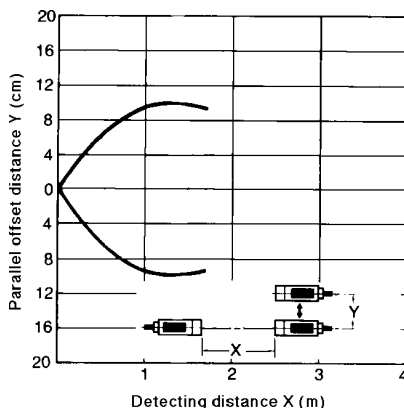


LIGHT SOURCE/RECEIVER SETTING RANGE, continued

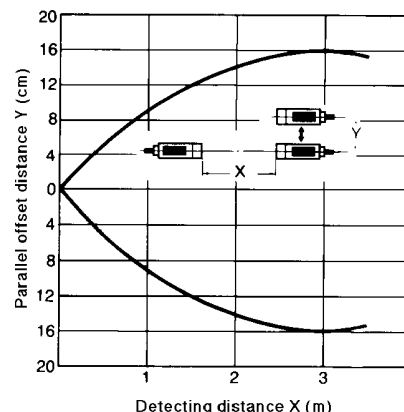
E3C-S50



E3C-1



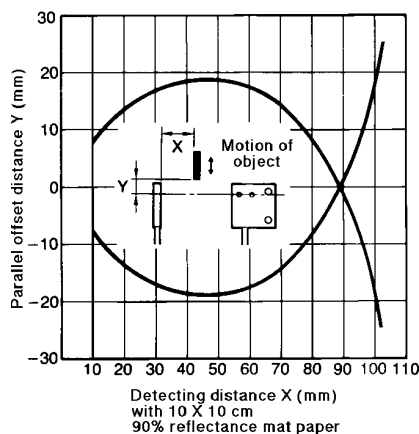
E3C-2



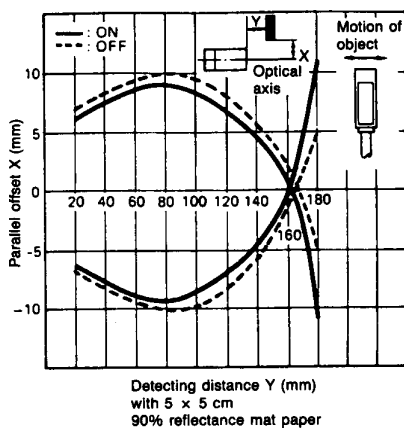
■ OPERATING RANGE

Diffuse Reflective Type

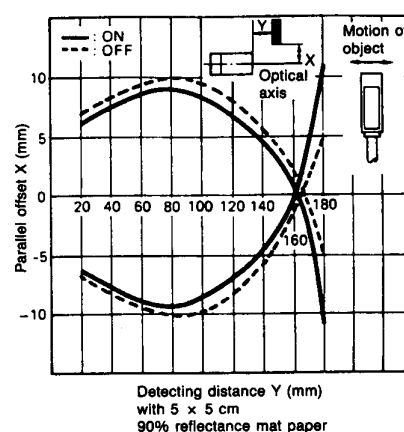
E3C-DS50



E3C-DS10 (Example 1)



E3C-DS10 (Example 2)

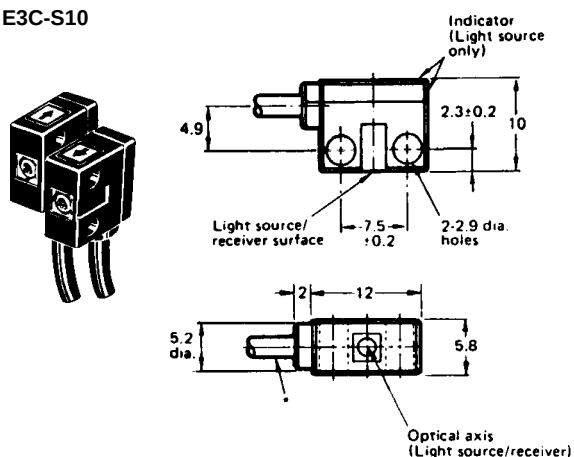


Dimensions

Unit: mm

■ SENSORS

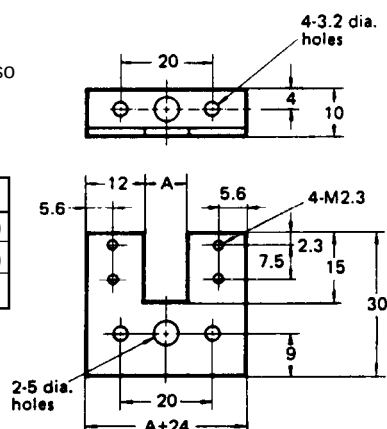
E3C-S10



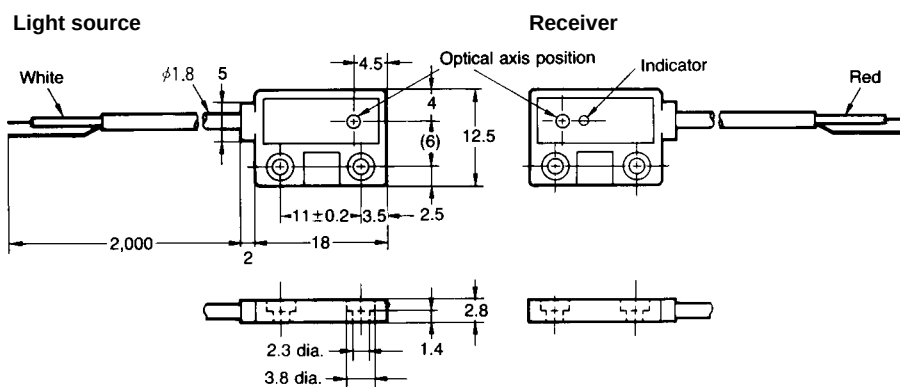
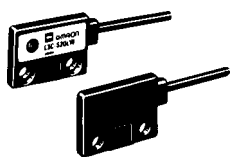
Mounting Brackets for E3C-S10

Mount the emitter and receiver on the legs of the U-shaped bracket so they face each other. Dimension "A" shows the fixed sensing distance.

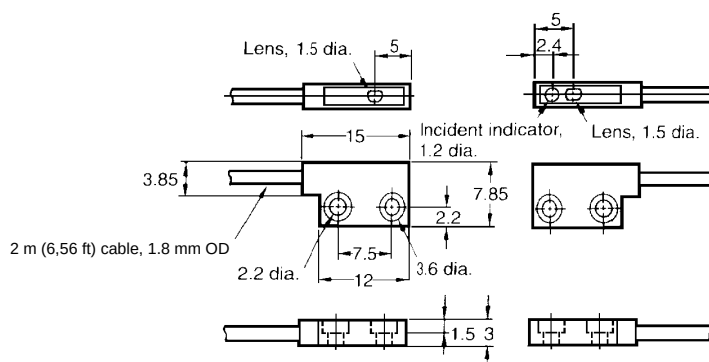
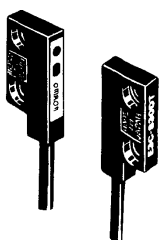
Part number	Dimension A
OAC-T1	10 mm (0.394 in)
OAC-T1	20 mm (0.787 in)
OAC-T3	30 mm (1.81 in)



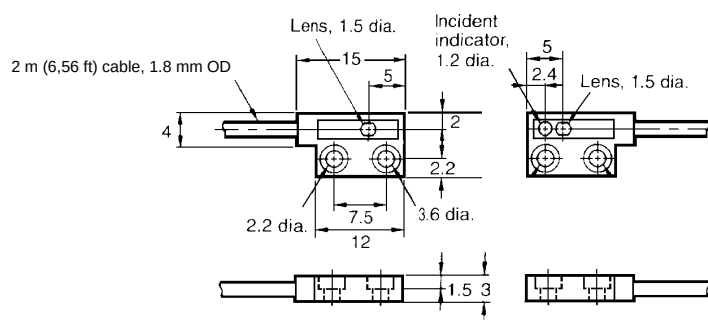
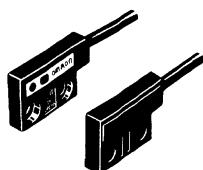
E3C-S20W



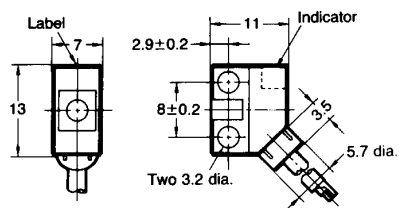
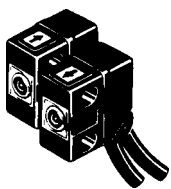
E3C-S30T



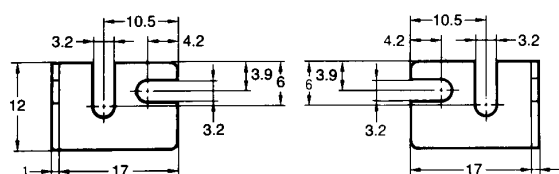
E3C-S30W



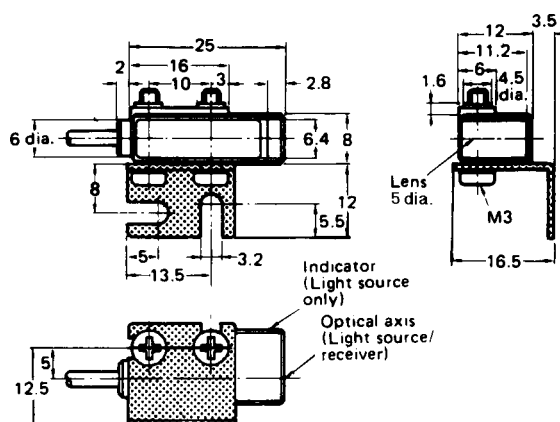
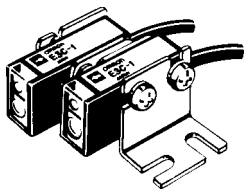
E3C-S50



E39-L31 Optional Mounting Bracket

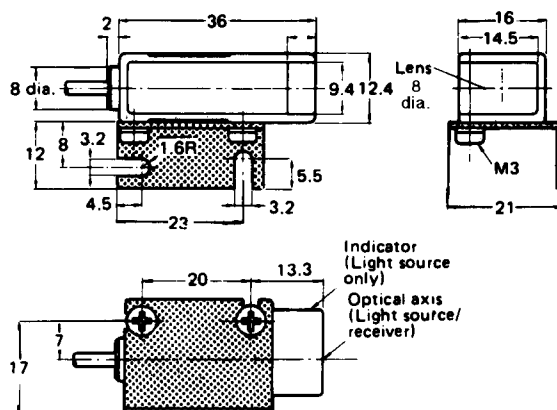
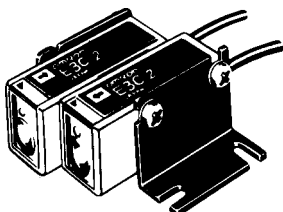


E3C-1



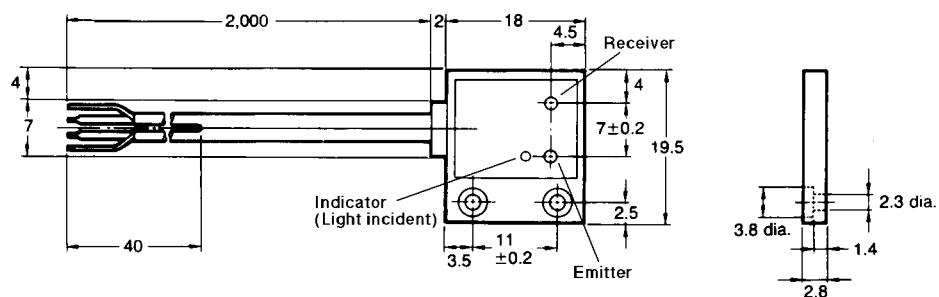
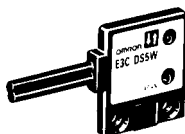
NOTE:
E3C-1 is shown
mounted in E39-L41
bracket supplied with
each sensor.

E3C-2

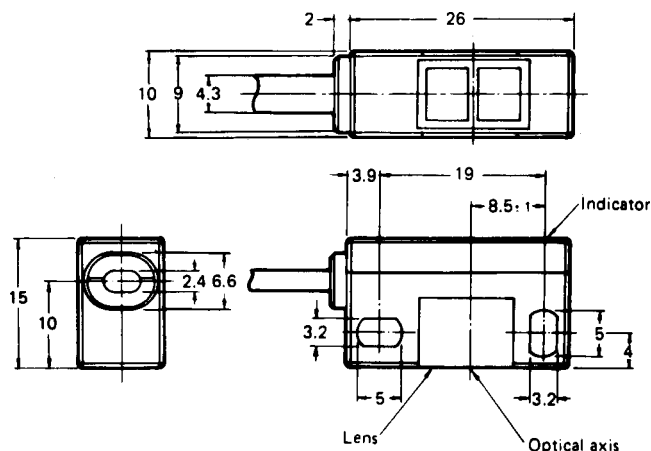
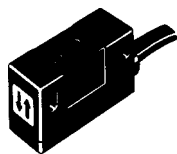


NOTE:
E3C-2 is shown mounted
in E39-L42 bracket
supplied with each
sensor.

E3C-DS5W



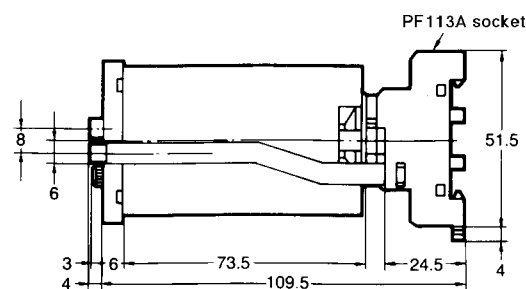
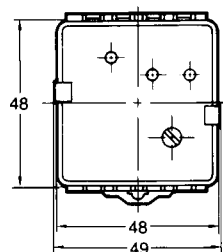
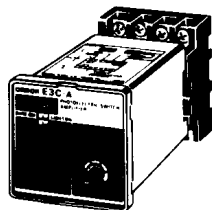
E3C-DS10



NOTE:
Use mounting bracket
E39-L42, shown on
E3C-2; order separately
from Accessories.

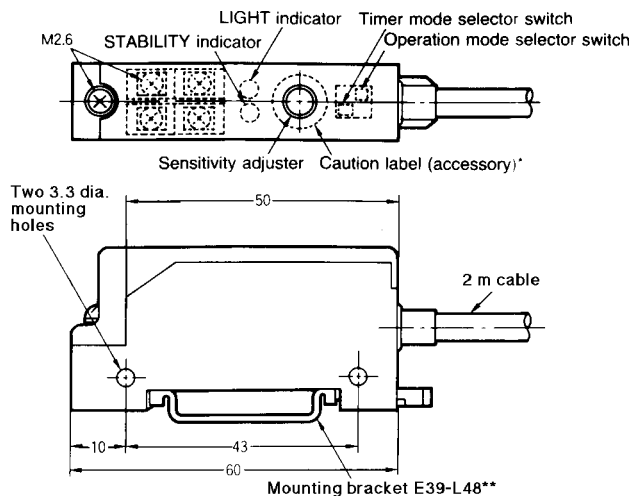
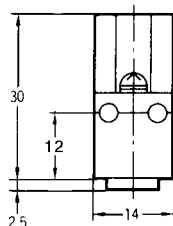
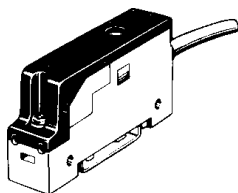
■ AMPLIFIERS

E3C-A, E3C-C



NOTE: Socket PF113A-E and two hold-down clips are included with these amplifiers.

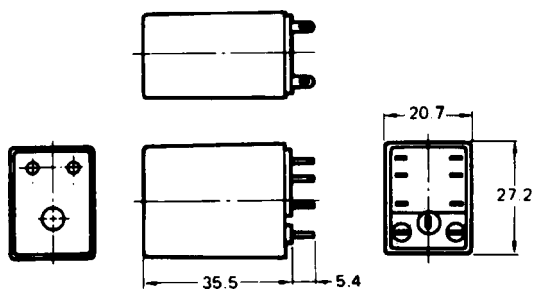
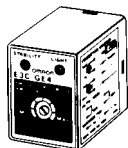
E3C-JB4P, E3C-JC4P



* Attach the caution label after adjusting the sensitivity adjuster.

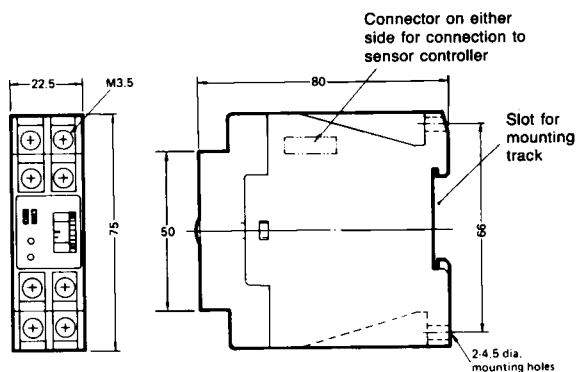
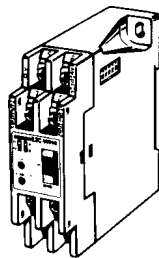
** This is not necessary when mounting the amplifier
on DIN rail track.

E3C-GE4, E3C-GF4

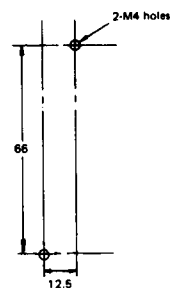


NOTE:
Order required socket
PYF08A-E or PYF08M from
Accessories section.

E3C-WH4F



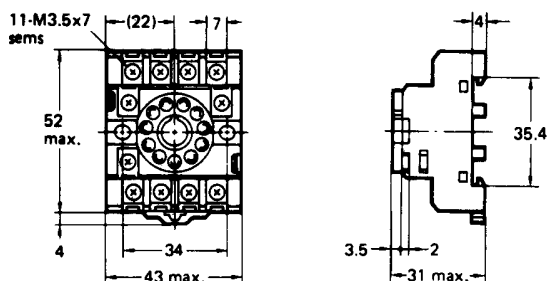
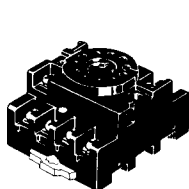
Mounting holes



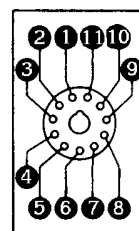
■ SOCKETS

PF113A-E Track-Mount Socket

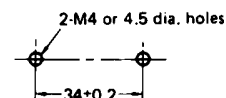
Socket PF113A-E and two hold-down clips are supplied with E3C-A and E3C-C amplifiers.



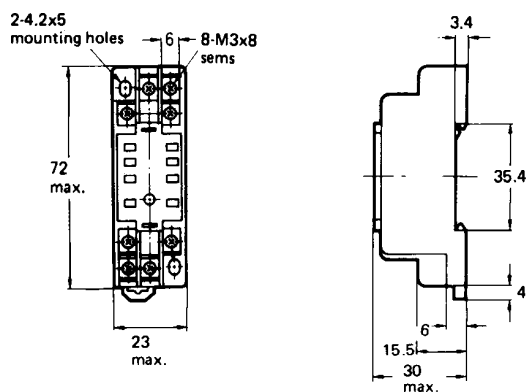
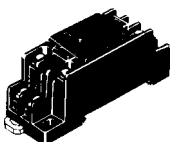
Terminal arrangement (top view)



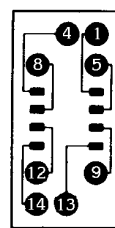
Mounting holes



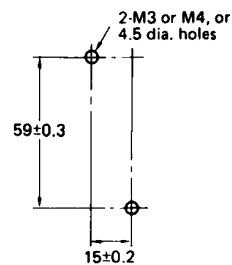
PYF08A-E Combination Track and Bottom Mount Socket for E3C-GE4, E3C-GF4



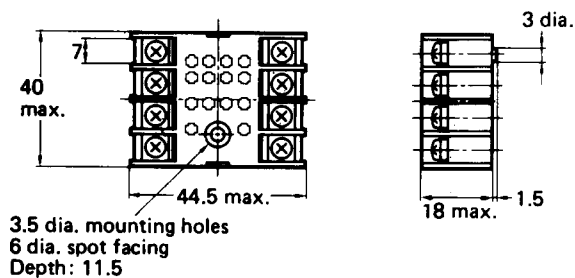
Terminal arrangement (top view)



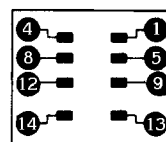
Mounting holes



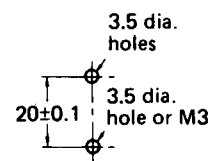
PYF08M Bottom Surface Mount Socket for E3C-GE4, E3C-GF4



Terminal arrangement (top view)

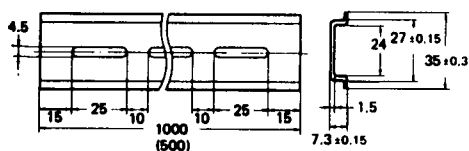


Mounting holes

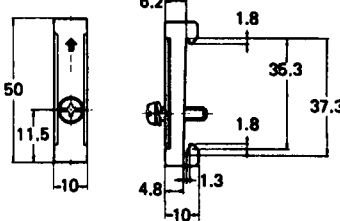


■ MOUNTING TRACK AND ACCESSORIES

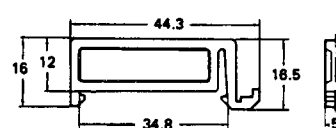
PFP-100N/PFP-50N DIN Rail



PFP-M End Plate



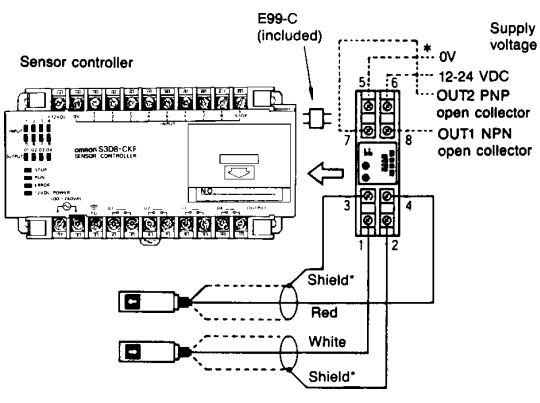
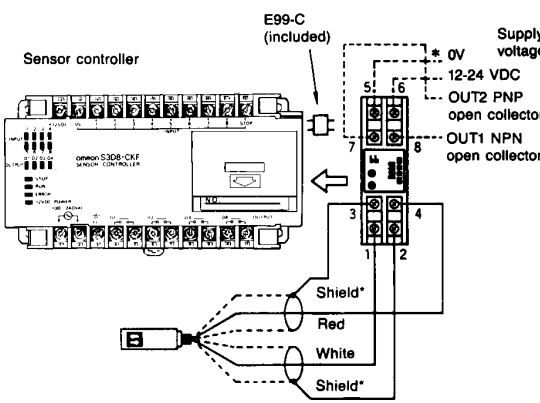
PFP-S Spacer



Connections

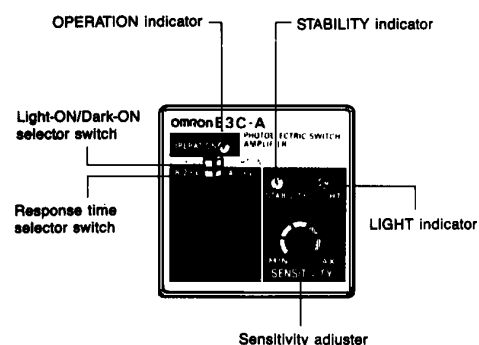
Amplifier model	Sensors	
	Through-beam type	Diffuse reflective type
	E3C-S10, E3C-S20W, E3C-S30□, E3C-S50, E3C-1, E3C-2	E3C-DS5W, E3C-DS10
E3C-A, E3C-C		
E3C-JB4P and E3C-JC4P		
E3C-GE4		
Notes	*Shielded wires must not be peeled in excess of 2 cm (0.787 in) for receiver (white lead) and 5 cm (1.969 in) for the light source (red lead). **Response time is 1 ms when terminal 8 is left open and 2 ms when terminal 8 is short-circuited with the 0 V terminal of the power supply (negative side).	*Shielded wires must not be peeled in excess of 2 cm (0.787 in). **Response time is 1 ms when terminal 8 is left open and 2 ms when terminal 8 is short-circuited with the 0 V terminal of the power supply (negative side).

Connections, continued

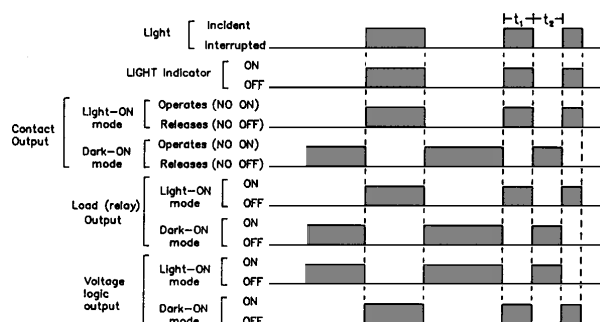
Amplifier model	Sensors	
	Through-beam type	Diffuse reflective type
	E3C-S10, E3C-S20W, E3C-S30□, E3C-S50, E3C-1, E3C-2	E3C-DS5W, E3C-DS10
E3C-WH4F	 NOTE: Terminals 5, 6, 7, and 8 are not used when connected to S3D8 or S3D-F sensor controllers.	 NOTE: Terminals 5, 6, 7, and 8 are not used when connected to S3D8 or S3D-F sensor controllers.
Notes	*Shielded wires must not be peeled in excess of 2 cm (0.787 in) for the receiver (white lead) and 5 cm (1.969 in) for the light source (red lead).	*Shielded wires must not be peeled in excess of 2 cm (0.787 in).

Operation

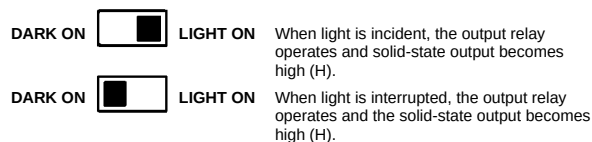
■ E3C-A Amplifier



■ E3C-A Timing Chart

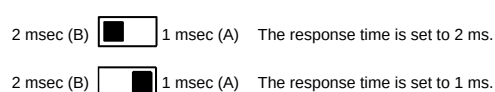


Selection of operation mode

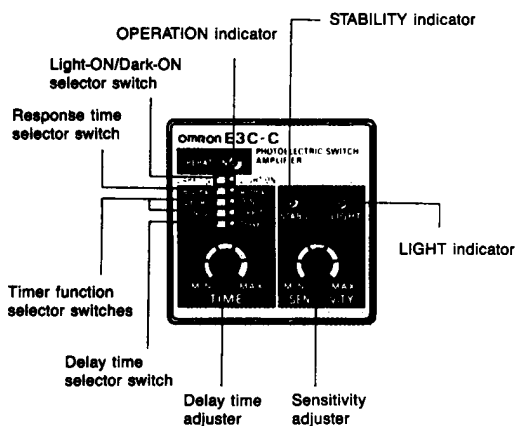


NOTE: 1. Control output is produced only during the input time.
2. When t exceeds 1 ms or 2 ms, solid-state output is produced. To produce relay contact output, t must be longer than 20 ms.

Selection of response time



■ E3C-C AMPLIFIER



Gate input operation

When the gate input terminal 9 is opened at HIGH level (6 to 30 VDC), the output relay performs the timer operation according to the input signal (light incident or light interrupted).

When the gate input terminal 9 is short-circuited with the 0 V terminal 2 at LOW level (0 to 2 VDC), the output relay releases without regard to the input signal or output state. The terminal generates an inhibit signal.

Selection of operation mode

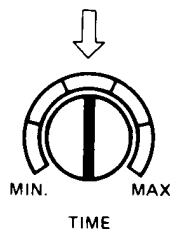
- DARK ON ☐ LIGHT ON ☐ When light is incident, the output relay operates and solid-state output becomes high (H).
- DARK ON ☐ LIGHT ON ☐ When light is interrupted, the output relay operates the solid-state output becomes high (H).

Selection of response time

- 2msec (B) ☐ 1msec (A) ☐ The response time is set to 2 ms.
- 2msec (B) ☐ 1msec (A) ☐ The response time is set to 1 ms.

Setting the delay time

- 1sec ☐ 10sec ☐ The delay time can be set within a range of 0.1 to 1 second.
- 1sec ☐ 10sec ☐ The delay time can be set within a range of 1 to 10 seconds.

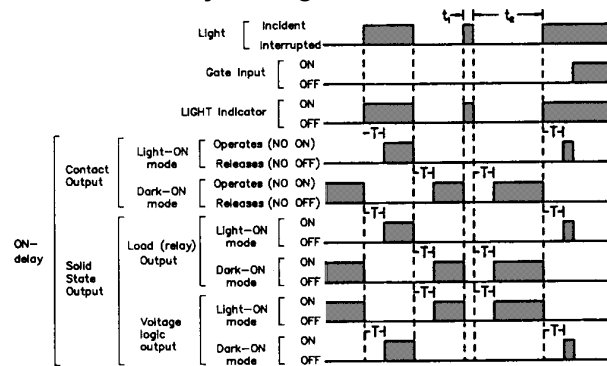


After selecting the delay time range by slide switch, set the delay time adjuster to the specific value. Turn the adjuster clockwise to increase the delay time.

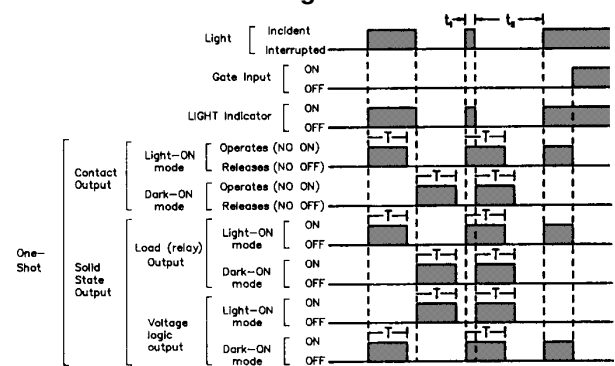
Selecting timer function

ON D. (ON-delay) operation	DARK ON ☐ LIGHT ON ☐ → Set to either position as desired. 2ms (B) ☐ 1ms (A) ☐ → Set to either position as desired. DELAY ☐ O.S.D. ☐ ON D. ☐ OFF D. ☐ 1sec ☐ 10sec ☐ → Set to either position as desired.
OFF D. (OFF-delay) operation	DARK ON ☐ LIGHT ON ☐ → Set to either position as desired. 2ms (B) ☐ 1ms (A) ☐ → Set to either position as desired. DELAY ☐ O.S.D. ☐ ON D. ☐ OFF D. ☐ 1sec ☐ 10sec ☐ → Set to either position as desired.
O.S.D. (One-shot delay) operation	DARK ON ☐ LIGHT ON ☐ → Set to either position as desired. 2ms (B) ☐ 1ms (A) ☐ → Set to either position as desired. DELAY ☐ O.S.D. ☐ ON D. ☐ OFF D. ☐ → Position of this switch is independent of this operation. 1sec ☐ 10sec ☐ → Set to either position as desired.

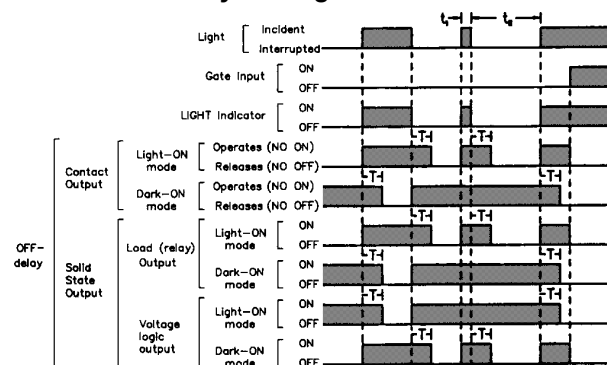
E3C-C ON-Delay Timing Chart



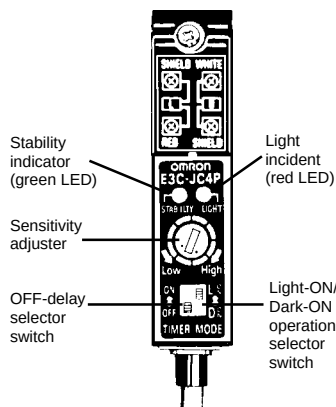
E3C-C One-Shot Timing Chart



E3C-C OFF-Delay Timing Chart

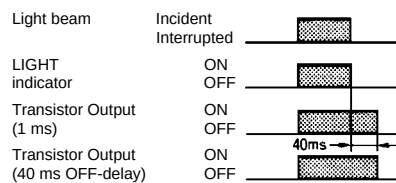


■ E3C-JB4P, E3C-JC4P AMPLIFIERS

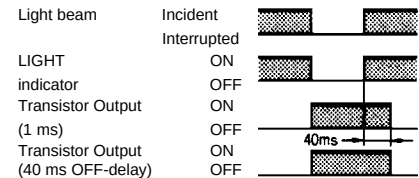


Timing Charts

Light-ON



Dark-ON

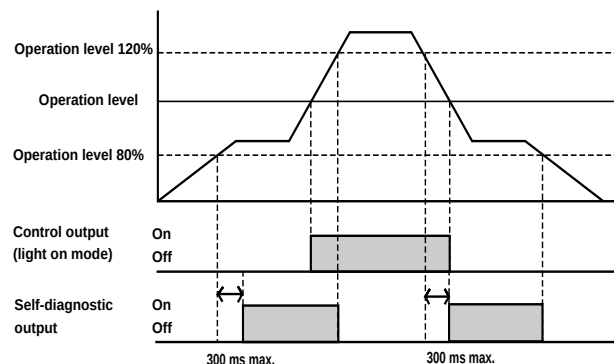


Alarm Output Timing Chart

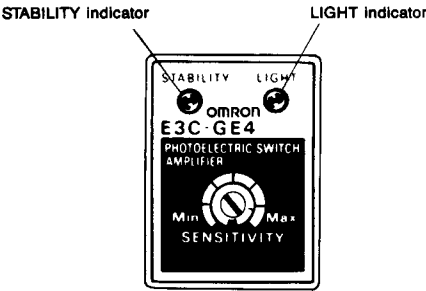
The alarm output operates when the control output approaches critical OFF or ON state for more than 300 ms. An unstable state occurs when the amount of light incident upon the receiving element is within 20% of the amount of light needed to change the control output state.

The alarm output feature is designed to indicate gradual changes in sensor/reflector position, atmosphere, temperature or ambient light which result in an unstable control output. A change occurring less than 300 ms will not cause the alarm output to operate.

A 300 ms time delay is built into the alarm output circuit. This prevents false triggering of the alarm output as the leading and trailing edges of the object to be detected are sensed. The time can be extended by using an ON-delay timer in the circuit.



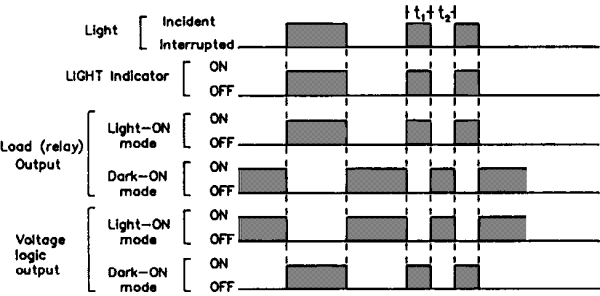
E3C-GE4 , E3C-GF4 AMPLIFIER



Selection of response time

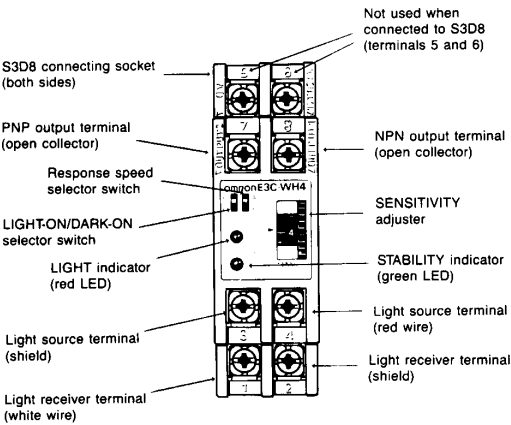
Response	Wiring
1 ms	Terminal 8 open
2 ms	Terminal 8 shorted with terminal 4 (0 V)

E3C-GF4 Timing Chart

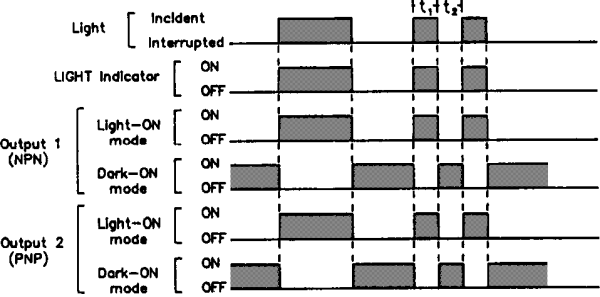


NOTE: t_1 and t_2 must exceed selected response time (1 or 2 ms) before solid-state output states will change.

E3C-WH4F AMPLIFIER

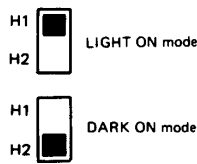


E3C-WH4F Timing Chart

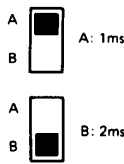


NOTE: t_1 and t_2 must exceed selected response time (1 or 2 ms) before solid-state output states will change.

Selection of operation mode



Selection of response time





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