

Photoelectric Sensor

E3F2

Threaded Cylindrical Photoelectric Sensor with Built-in Amplifier for Use as an Optical Proximity Sensor

- M18 DIN-sized cylindrical housing, ABS resin case.
- Compact and space-saving.
- Long sensing distance (30 cm) with sensitivity adjuster for diffuse type. (DC switching type)
- DC Switching types with connectors for easy maintenance.
- Wide operating voltage range (10 to 30 VDC, or 24 to 240 VAC).
- Short-circuit and reverse connection protection. (DC switching type)
- UL and CSA approved (AC switching type)



Ordering Information

DC Switching Models

Operating modes	Connection method	Control output	Sensing method	Sensing distance	Model
Light-ON or Dark-ON (selectable)	Pre-wired	Transistor output, NPN open collector	Through-beam	3 m (4 m typ.)	E3F2-3C4
			Retroreflective	2 m (2.5 m typ.)	E3F2-R2C4
			Diffuse reflective	10 cm	E3F2-R2C4-E (See note)
				30 cm (40 cm typ.)	E3F2-DS10C4-N
		Transistor output, PNP open collector	Through-beam	3 m (4 m typ.)	E3F2-3B4
			Retroreflective	2 m (2.5 m typ.)	E3F2-R2B4
			Diffuse reflective	10 cm	E3F2-R2B4-E (See note)
				30 cm (40 cm typ.)	E3F2-DS10B4-N
	Connector	Transistor output, NPN open collector	Through-beam	3 m (4 m typ.)	E3F2-DS30C4
			Retroreflective	2 m (2.5 m typ.)	E3F2-3C4-P1
			Diffuse reflective	10 cm	E3F2-R2C4-P1
				30 cm (40 cm typ.)	E3F2-R2C4-P1E (See note)
		Transistor output, PNP open collector	Through-beam	3 m (4 m typ.)	E3F2-DS10C4-P1
			Retroreflective	2 m (2.5 m typ.)	E3F2-3B4-P1
			Diffuse reflective	10 cm	E3F2-R2B4-P1
				30 cm (40 cm typ.)	E3F2-R2B4-P1E
					E3F2-DS10B4-P1
					E3F2-DS30B4-P1

Note: Without E39-R1 (Retroreflector)

AC Switching Models

Operating modes	Connection method	Control output	Sensing method	Sensing distance	Model
Light-ON (Fixed)	Pre-wired	AC solid state (SCR)	Through-beam	3 m (4 m typ.)	E3F2-3Z1
			Retroreflective	2 m (2.5 m typ.)	E3F2-R2Z1
			Diffuse reflective	10 cm	E3F2-DS10Z1-N
Dark-ON (Fixed)			Through-beam	3 m (4 m typ.)	E3F2-3Z2
			Retroreflective	2 m (2.5 m typ.)	E3F2-R2Z2-N
			Diffuse reflective	10 cm	E3F2-DS10Z2

■ Accessories (Order Separately)

Name	Model
Retroreflector	E39-R1, E39-R3
Retroreflector (tape type)	E39-RSA, E39-RSB
Lens Cap	E39-F31
Mounting Bracket	Y92E-B18

■ Connector

Plugs (Order Separately)

Cord	Appearance		Cord length	Model
Standard	Straight (4 conductor)		2 m	XS2F-D421-D80-A
			5 m	XS2F-D421-G80-A
	L-shape (4 conductor)		2 m	XS2F-D422-D80-A
			5 m	XS2F-D422-G80-A
Robot (vibration-proof)	Straight (4 conductor)		2 m	XS2F-D421-D80-R
			5 m	XS2F-D421-G80-R
	L-shape (4 conductor)		2 m	XS2F-D422-D80-R
			5 m	XS2F-D422-G80-R

Specifications

Item	DC switching type	AC switching type
Light source	Pulse modulated Infrared LED	
Indicators	Light incident indicator (red) (power indicator for light source)	
Sensitivity adjustment	Only for E3F2-DS30□□	Fixed
Connection method	Pre-wired (2 m) or connector	Pre-wired (2 m)
Operation mode	Light-ON or Dark-ON (selectable with wiring)	Light-ON or Dark-ON (separate model)
Circuit protection	Output short-circuit protection, DC power supply reverse polarity protection	None
Weight	Pre-wired cable models: Approx. 110 g Connector models: Approx. 55 g	
Materials	Case: ABS resin Lens: Acrylate resin	

■ Ratings/Characteristics

DC Switching Models

Item	E3F2-3C4-□, E3F2-3B4-□	E3F2-R2C4-□, E3F2-R2B4-□	E3F2-DS10C4-□, E3F2-DS10B4-□	E3F2-DS30C4-□, E3F2-DS30B4-□
	Through-beam	Retroreflective	Diffuse reflective	
Power supply voltage	10 to 30 VDC (Including 10% ripple)			
Current consumption	45 mA max. (Light source and receiver)	25 mA max.		
Sensing distance (typ., see note 1)	3 m (4 m typ.)	0.1 to 2 m (2.5 m typ.) (E39-R1 Reflector)	10 cm (5 x 5 cm white mat paper)	30 cm (40 cm typ.) (10 x 10 cm white mat paper)
Sensing object	Opaque object: 11 mm min.	Opaque object: 56 mm min.	Transparent, opaque objects	
Directional angle	3° to 20°		---	
Differential travel	---		20% max.	
Response time	2.5 ms max.			
Control output	Transistor output (open collector) 100 mA max.; residual voltage: 2 V max. at 100 mA			
Power reset time	50 ms max.			
Ambient illumination (see note 2)	Incandescent lamp: Illumination on optical spot: 3,000 lx max. Sunlight: Illumination on optical spot: 10,000 lx max.			
Ambient temperature	Operating: -25°C to 55°C (with no icing) Storage: -30°C to 70°C (with no icing)			
Ambient humidity	Operating: 35% to 85% Storage: 35% to 95%			
Insulation resistance	20 MΩ min. (at 500 VDC) between current carry parts and case			
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between current carry parts and case			
Vibration resistance	10 to 55 Hz, 1.5-mm double amplitude for 2 hrs each in X, Y, and Z directions			
Shock resistance	500 m/s ² (approx. 50G)			
Enclosure ratings	IEC IP66, NEMA 1, 2, 4 (indoor)			

Note: 1. Actual stable sensing distance. For details, see the Gain vs. Set distance ratios in "Engineering Data."

2. The intensity of illumination on the surface of the receiver with a 20% fluctuation of the optical output per 200 lx. This is not the maximum available operating illumination.

AC Switching Models

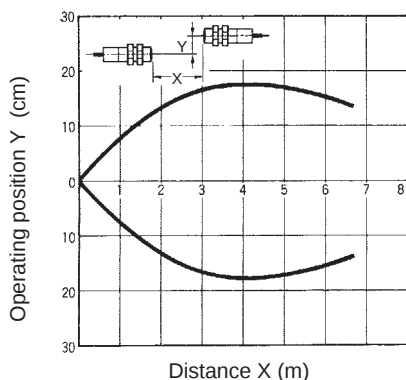
Item	E3F2-3Z1, E3F2-3Z2	E3F2-R2Z1, E3F2-R2Z2	E3F2-DS10Z1-N, E3F2-DS10Z2-N
	Through-beam	Retroreflective	Diffuse reflective
Power supply voltage	24 to 240 VAC $\pm$ 10%, 50/60 Hz		
Current consumption	10 mA max. (Light source and receiver)	5 mA max.	
Sensing distance (typ., see note 1)	3 m (4 m typ.)	0.1 to 2 m (2.5 m typ.) (E39-R1 Reflector)	10 cm (5 x 5 cm white mat paper)
Sensing object	Opaque object: 11 mm min.	Opaque object: 56 mm min.	Transparent, opaque objects
Directional angle	3° to 20°		---
Differential travel	---		20% max.
Response time	30 ms max.		
Control output	AC solid state (SCR) 200 mA max.; residual voltage: 5 V max. at 200 mA (see note 3)		
Power reset time	100 ms max.		
Ambient illumination (see note 2)	Incandescent lamp: Illumination on optical spot: 3,000 lx max. Sunlight: Illumination on optical spot: 10,000 lx max.		
Ambient temperature	Operating: -25°C to 55 °C (with no icing) Storage: -30°C to 70 °C (with no icing)		
Ambient humidity	Operating: 35% to 85% Storage: 35% to 95%		
Insulation resistance	20 M Ω min. (at 500 VDC) between current carry parts and case		
Dielectric strength	1,500 VAC, 50/60 Hz for 1 min between current carry parts and case		
Vibration resistance	10 to 55 Hz, 1.5-mm double amplitude for 2 hrs each in X, Y, and Z directions		
Shock resistance	500 m/s ² (approx. 50G)		
Enclosure ratings	IEC IP66, NEMA 1, 2, 4 (indoor)		

- Note:**
1. Actual stable sensing distance. For details, see the Gain vs. Set distance ratios in "Engineering Data."
 2. The intensity of illumination on the surface of the receiver with a 20% fluctuation of the optical output per 200 lx. This is not the maximum available operating illumination.
 3. When you use the Photoelectric Sensor at the temperature over 45°C, the load current must be within derated value. Please refer to "Precautions."

Engineering Data

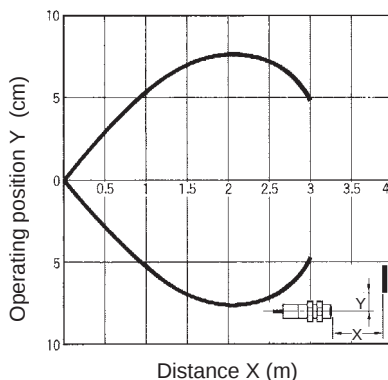
Operating Range (Typical)

E3F2-3□□-□□ (Through-beam)



Operating Range (Typical)

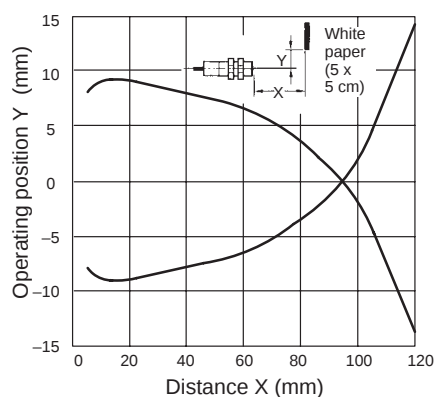
E3F2-R2□□-□□ (Retroreflective)



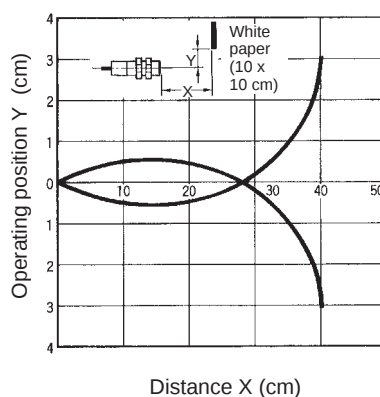
Operating Range (Typical)

E3F2-DS10□□-N

E3F2-DS10□□4-P1



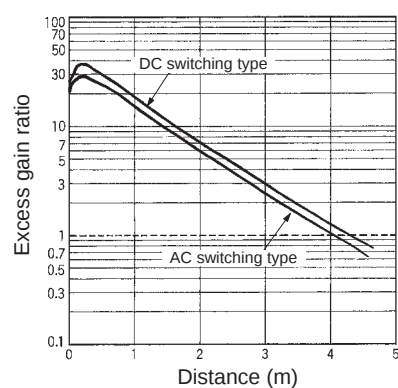
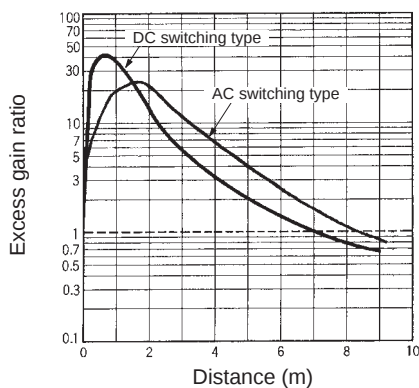
E3F2-DS30□□-□□



Excess Gain vs. Set Distance (Typical)

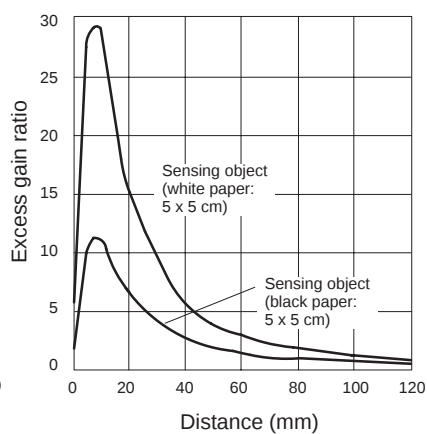
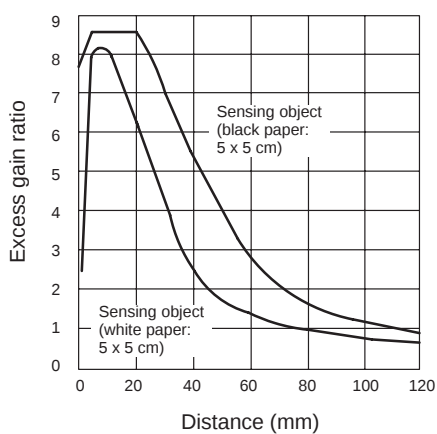
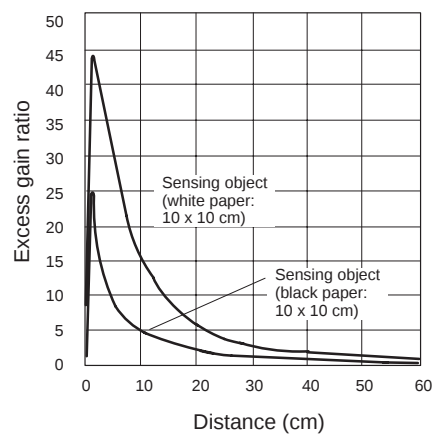
E3F2-3□□-□□

E3F2-R2□□-□□



Excess Gain vs. Set Distance

E3F2-DS10Z□□-N

E3F2-DS10□□4-N
E3F2-DS10□□4-P1E3F2-DS30□□4
E3F2-DS30□□4-P1

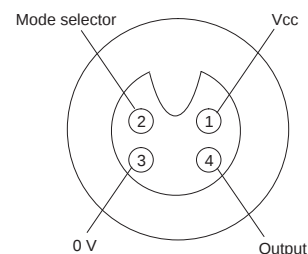
Operation

■ Output Circuits

Configura- tion	Model	Connection method	Output transistor	Output circuit
NPN pre-wired cable	E3F2-3C4 E3F2-R2C4 E3F2-DS10C4-N E3F2-DS30C4	Connect the pink and brown cords or open the pink cord.	ON when light is in- cident. (Light-ON)	
		Connect the pink and blue cords.	ON when light is in- terrupted. (Dark-ON)	
PNP pre-wired cable	E3F2-3B4 E3F2-R2B4 E3F2-DS10B4-N E3F2-DS30B4	Connect the pink and brown cords or open the pink cord.	ON when light is in- cident. (Light-ON)	
		Connect the pink and blue cords.	ON when light is in- terrupted. (Dark-ON)	
NPN connector	E3F2-3C4-P1 E3F2-R2C4-P1 E3F2-DS10C4- P1 E3F2-DS30C4- P1	Connect the pink and brown cords or open the pink cord.	ON when light is in- cident. (Light-ON)	
		Connect the pink and blue cords.	ON when light is in- terrupted. (Dark-ON)	

Note: Terminals No. for Connector type.

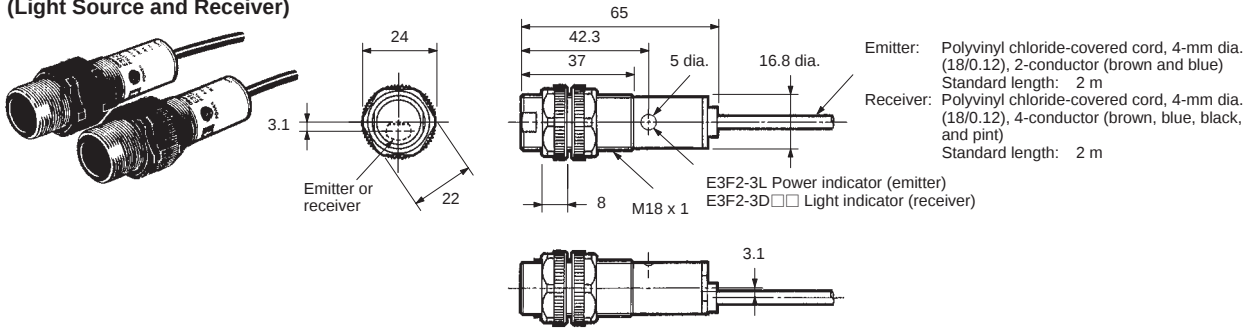
Light-ON Mode



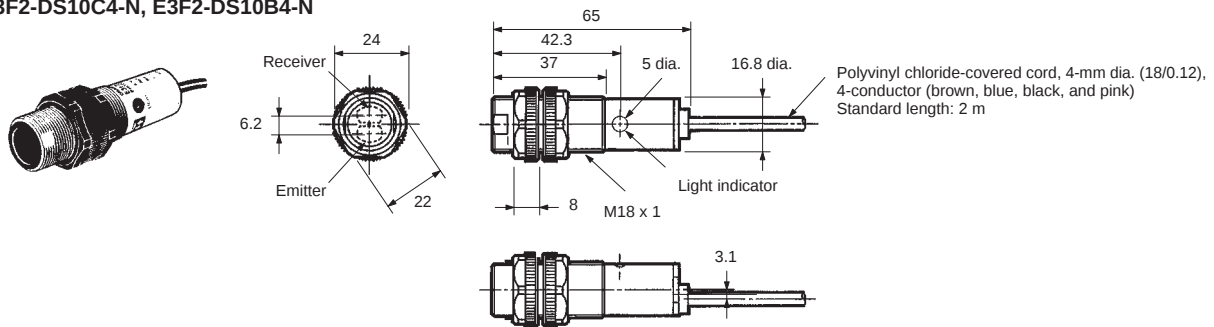
Dimensions

Note: All units are in millimeters unless otherwise indicated.

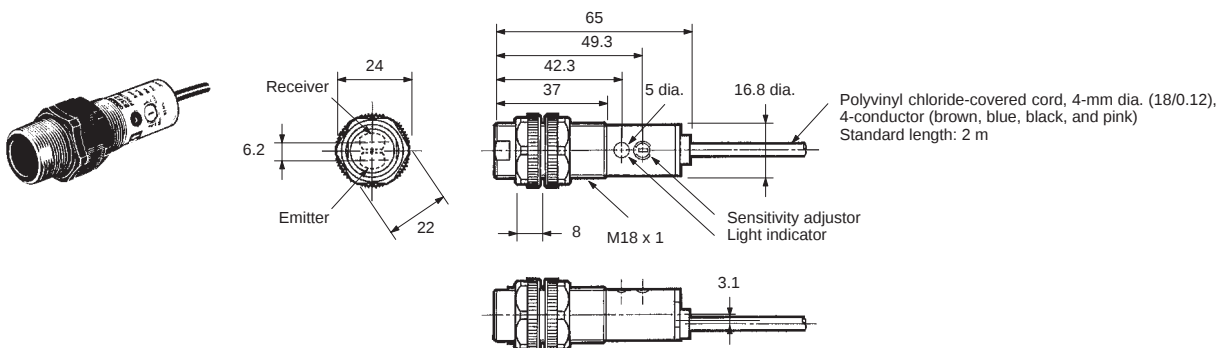
E3F2-3C4, E3F2-3B4 (Light Source and Receiver)



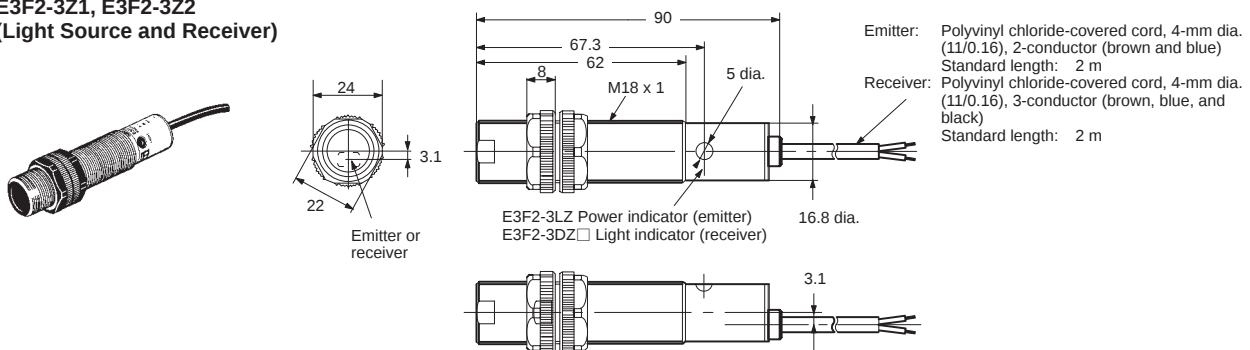
E3F2-R2C4, E3F2-R2B4 E3F2-DS10C4-N, E3F2-DS10B4-N



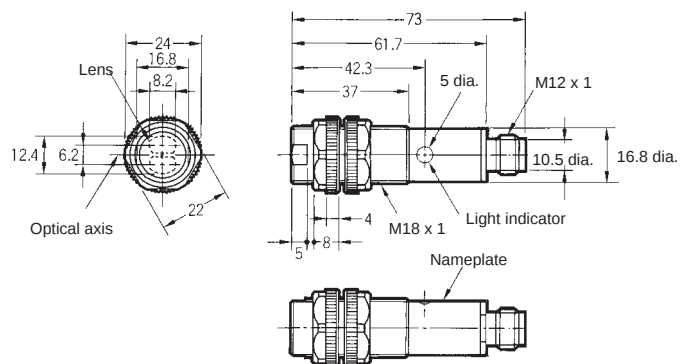
E3F2-DS30C4, E3F2-DS30B4



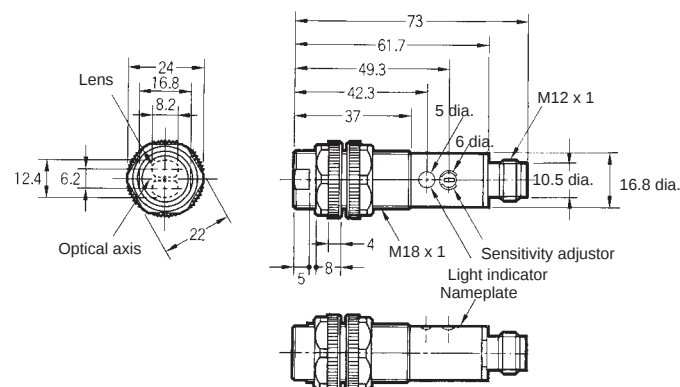
E3F2-3Z1, E3F2-3Z2 (Light Source and Receiver)



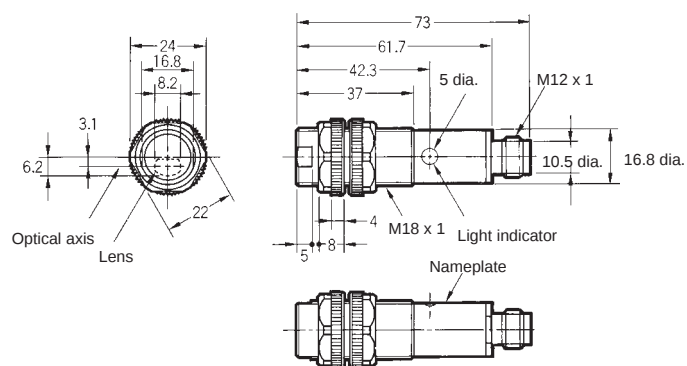
E3F2-R2□4-P1
E3F2-DS10□4-P1



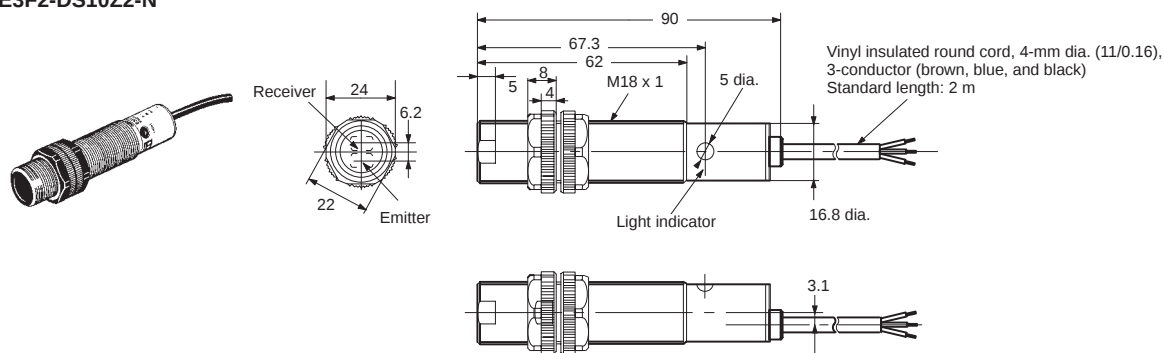
E3F2-DS30□4-P1



E3F2-3□4-P1

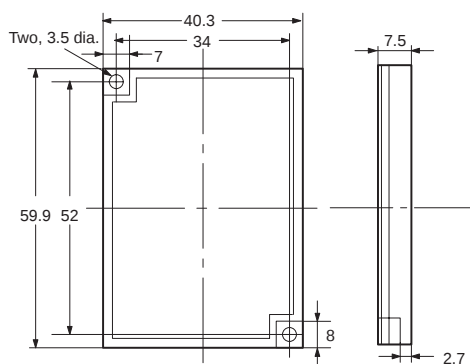
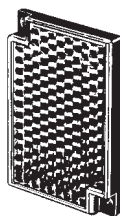


E3F2-R2Z1, E3F2-R2Z2
E3F2-DS10Z1-N,
E3F2-DS10Z2-N



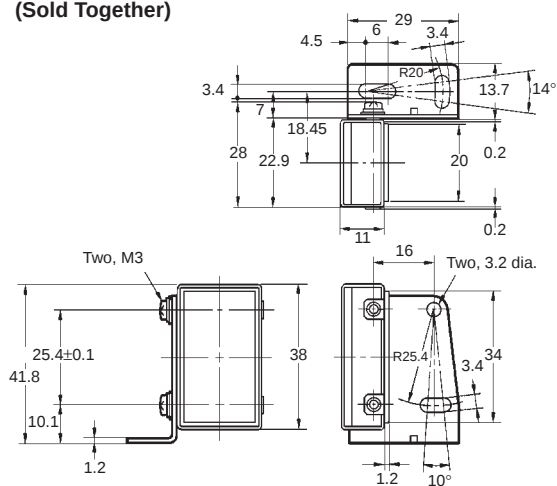
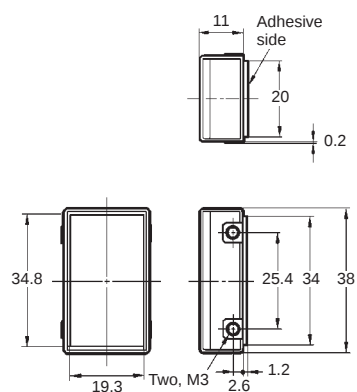
Accessories

E39-R1 Retroreflector

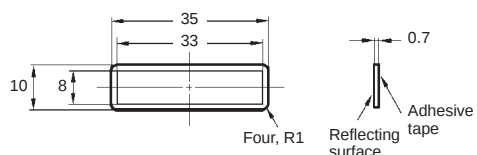


E39-R3 Retroreflector

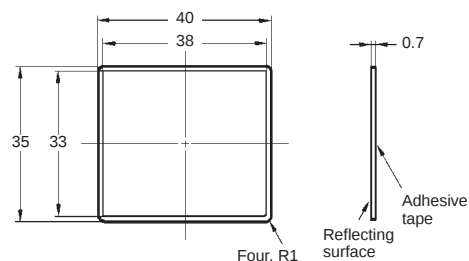
**Mounting Bracket for E39-R3
(Sold Together)**



E39-RSA Retroreflector



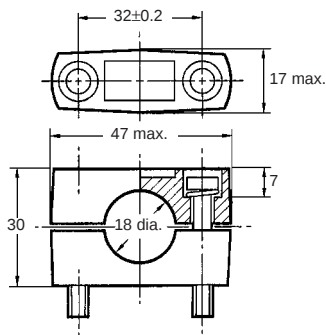
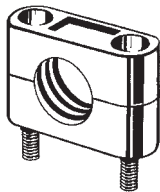
E39-RSB Retroreflector



Note: When connected to the E3F2-R2, the sensing distance for each Retroreflector will differ as seen below.

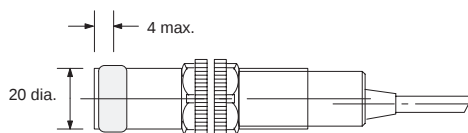
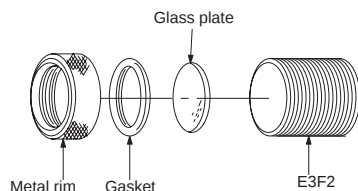
Retroreflector	E39-R3	E39-RSA	E39-RSB
Sensing distance	5 to 100 cm	20 to 50 cm	20 to 80 cm

Y92E-B18 Mounting Bracket



Note: Hexagonal bolt: M5 x 32
Material: plastic

E39-F31 Lens Cap

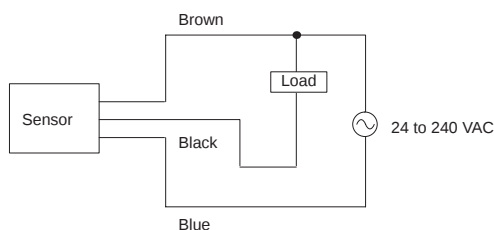


Precautions

If the input/output lines of the Photoelectric Sensor are placed in the same conduit or duct as power lines or high-voltage lines, the Photoelectric Sensor could be induced to malfunction, or even be damaged, by electrical noise. Separate the wiring, or use shielded lines as input/output lines to the Photoelectric Sensor.

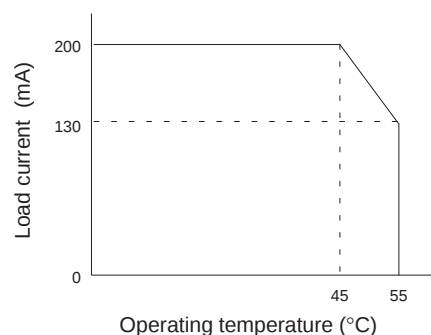
Do not subject the Photoelectric Sensor to excessive shock when mounting, in keeping with IP66 standards.

Do not connect the black wire to the brown wire without a load. Direct connection of these wires may damage the Photoelectric Sensor (AC switching type).



When you use the Photoelectric Sensor in the vicinity of an inverter motor, be sure to connect the protective earth ground wire of the motor to earth. Failure to ground the motor may result in malfunction of the Sensor.

When you use the Photoelectric Sensor at temperatures over 45°C, the load current must be within the derated value shown in the figure below.

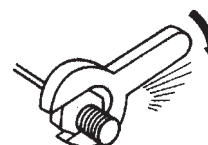


! WARNING

The E3F2 Photoelectric Sensor is not a safety component for ensuring the safety of people which is defined in EC Directive (91/368/EEC) and covered by separate European standards or by any other regulations or standards.

Mounting

Do not exceed a torque of 20 kgf • cm (2.0 N • m) when tightening mounting nuts.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. E224-E1-5 In the interest of product improvement, specifications are subject to change without notice.

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