

# Photoelectric Sensors E3F2

## Threaded Cylindrical Photoelectric Sensors with Built-in Amplifier for Use as an Optical Proximity Switch

- M18 DIN-sized cylindrical housing
- Housing materials: plastic, nickel plated brass and stainless steel
- Axial and radial types (with integrated 90°-optics)
- Enclosure rating IP67
- DC switching types with connectors for easy maintenance
- Full metal plug-in type
- Sensing distance separate types: 7 m, 10 m
- Retroreflective polarizing types: 2 m, 4 m
- Background suppression type: 10 cm
- Long detection distance (0.3 m, 1 m) with sensitivity adjuster for diffuse type
- Wide-beam characteristics (10 cm) for diffuse type
- 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 types)
- UL listed (DC switching types)


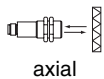
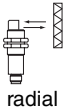
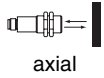
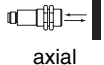


# Ordering Information

## ■ DC-Switching Models

### Housing Material: Plastic

**Note:** Shaded models are normally stocked.

Sensing method		Appearance	Connection method	Sensing distance	Model			
					PNP output	NPN output		
Through-beam	Multi purpose		pre-wired	7 m	<b>E3F2-7B4</b>	<b>E3F2-7C4</b>		
			M12 connector		<b>E3F2-7B4-P1</b>	<b>E3F2-7C4-P1</b>		
	- precision detection <sup>(*)</sup> - test input		pre-wired	10 m	<b>E3F2-10B4</b>	<b>E3F2-10C4</b>		
			M12 connector		<b>E3F2-10B4-P1</b>	<b>E3F2-10C4-P1</b>		
Retro-reflective (incl. reflector E39-R1 or E39-R1S)	Non-polarizing (without MSR function)		pre-wired	0.1 - 2 m <sup>(2)</sup>	<b>E3F2-R2B4</b>	<b>E3F2-R2C4</b>		
			M12 connector		<b>E3F2-R2B4-P1</b>	<b>E3F2-R2C4-P1</b>		
	Polarizing (with MSR function)		Fixed sensitivity	pre-wired	0.1 - 4 m <sup>(3)</sup>	<b>E3F2-R4B4F</b>	<b>E3F2-R4C4F</b>	
				M12 connector		<b>E3F2-R4B4F-P1</b>	<b>E3F2-R4C4F-P1</b>	
	Adjustable sensitivity		Adjustable sensitivity	pre-wired	0.1 - 4 m <sup>(3)</sup>	<b>E3F2-R4B4</b>	<b>E3F2-R4C4</b>	
				M12 connector		<b>E3F2-R4B4-P1</b>	<b>E3F2-R4C4-P1</b>	
	Polarizing (with MSR function)		Adjustable sensitivity		pre-wired	0.1 - 2 m <sup>(2)</sup>	<b>E3F2-R2RB41</b>	<b>E3F2-R2RC41</b>
					M12 connector		<b>E3F2-R2RB41-P1</b>	<b>E3F2-R2RC41-P1</b>
Diffuse reflective	Fixed sensitivity Wide-beam characteristics		pre-wired		0.1 m	<b>E3F2-DS10B4-N</b>	<b>E3F2-DS10C4-N</b>	
			M12 connector			<b>E3F2-DS10B4-P1</b>	<b>E3F2-DS10C4-P1</b>	
	Adjustable sensitivity		0.3 m	pre-wired	<b>E3F2-DS30B4</b>	<b>E3F2-DS30C4</b>		
				M12 connector	<b>E3F2-DS30B4-P1</b>	<b>E3F2-DS30C4-P1</b>		
			1 m	pre-wired	<b>E3F2-D1B4</b>	<b>E3F2-D1C4</b>		
				M12 connector	<b>E3F2-D1B4-P1</b>	<b>E3F2-D1C4-P1</b>		
Adjustable sensitivity	0.3 m	pre-wired	<b>E3F2-DS30B41</b>	<b>E3F2-DS30C41</b>				
		M12 connector	<b>E3F2-DS30B41-P1</b>	<b>E3F2-DS30C41-P1</b>				
Background suppression	Fixed sensing distance		pre-wired	10 cm	<b>E3F2-LS10B4</b>	<b>E3F2-LS10C4</b>		
			M12 connector		<b>E3F2-LS10B4-P1</b>	<b>E3F2-LS10C4-P1</b>		

\*1) with slit E39-ES18

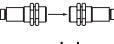
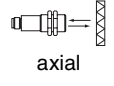
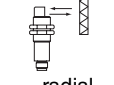
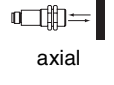
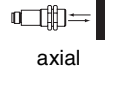


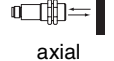
\*2) with reflector E39-R1

\*3) with reflector E39-R1S

**Note:** Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4 2M or E3F2-R2RB4 5M). For other cable length please contact your OMRON sales representative.

## ■ Housing material: Metal (Nickel plated brass)

**Note:** Shaded models are normally stocked.

Sensing method		Appearance	Connection method	Sensing distance	Model				
					PNP output	NPN output			
Through-beam	Multi purpose	 axial	pre-wired	7 m	<b>E3F2-7B4-M</b>	<b>E3F2-7C4-M</b>			
			M12 connector		<b>E3F2-7B4-M1-M</b>	<b>E3F2-7C4-M1-M</b>			
	- precision detection - test input		pre-wired	10 m	<b>E3F2-10B4-M</b>	<b>E3F2-10C4-M</b>			
			M12 connector		<b>E3F2-10B4-M1-M</b>	<b>E3F2-10C4-M1-M</b>			
Retro-reflective (incl. reflector E39-R1)	Polarizing (with MSR function)	 axial	pre-wired	0.1 - 2 m <sup>(*)</sup>	<b>E3F2-R2RB4-M</b>	<b>E3F2-R2RC4-M</b>			
			M12 connector		<b>E3F2-R2RB4-M1-M</b>	<b>E3F2-R2RC4-M1-M</b>			
			Adjustable sensitivity	pre-wired	0.1 - 4 m <sup>(*)</sup>	<b>E3F2-R4B4F-M</b>	<b>E3F2-R4C4F-M</b>		
				M12 connector		<b>E3F2-R4B4F-M1-M</b>	<b>E3F2-R4C4F-M1-M</b>		
	Polarizing (with MSR function)	 radial	pre-wired	0.1 - 2 m <sup>(*)</sup>	<b>E3F2-R2RB41-M</b>	<b>E3F2-R2RC41-M</b>			
			M12 connector						
			Diffuse reflective	Fixed sensing distance Wide-beam characteristics	 axial	pre-wired	0.1 m	<b>E3F2-DS10B4-M</b>	<b>E3F2-DS10C4-M</b>
						M12 connector		<b>E3F2-DS10B4-M1-M</b>	<b>E3F2-DS10C4-M1-M</b>
Adjustable sensing distance	Adjustable sensing distance	 axial	pre-wired	0.3 m	<b>E3F2-DS30B4-M</b>	<b>E3F2-DS30C4-M</b>			
			M12 connector		<b>E3F2-DS30B4-M1-M</b>	<b>E3F2-DS30C4-M1-M</b>			
			Adjustable sensing distance	Adjustable sensing distance	 radial	pre-wired	1 m	<b>E3F2-D1B4-M</b>	<b>E3F2-D1C4-M</b>
						M12 connector		<b>E3F2-D1B4-M1-M</b>	<b>E3F2-D1C4-M1-M</b>
Adjustable sensing distance	Adjustable sensing distance	 radial	pre-wired	0.3 m	<b>E3F2-DS30B41-M</b>	<b>E3F2-DS30C41-M</b>			
			M12 connector		<b>E3F2-DS30B41-M1-M</b>	<b>E3F2-DS30C41-M1-M</b>			
Background suppression	Fixed sensing distance	 axial	pre-wired	10 cm	<b>E3F2-LS10B4-M</b>	<b>E3F2-LS10C4-M</b>			
			M12 connector		<b>E3F2-LS10B4-M1-M</b>	<b>E3F2-LS10C4-M1-M</b>			


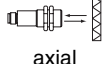
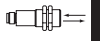
\*1) with reflector E39-R1

\*2) with reflector E39-R1S

**Note:** Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4 2M or E3F2-R2RB4 5M). For other cable length please contact your OMRON sales representative.

## ■ Housing material: Metal (Stainless steel)

**Note:** Shaded models are normally stocked.


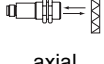
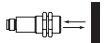
Sensing method		Appearance	Connection method	Sensing distance	Model	
					PNP output	NPN output
Through-beam		 axial	pre-wired	7 m	<b>E3F2-7B4-S</b>	<b>E3F2-7C4-S</b>
			M12 connector		<b>E3F2-7B4-M1-S</b>	<b>E3F2-7C4-M1-S</b>
Retro-reflective (incl. reflector E39-R1)	Polarizing (with MSR function)	 axial	pre-wired	0.1 - 2 m (with reflector E39-R1)	<b>E3F2-R2RB4-S</b>	<b>E3F2-R2RC4-S</b>
			M12 connector		<b>E3F2-R2RB4-M1-S</b>	<b>E3F2-R2RC4-M1-S</b>
Diffuse reflective	Fixed sensitivity Wide-beam characteristics	 axial	pre-wired	0.1 m	<b>E3F2-DS10B4-S</b>	<b>E3F2-DS10C4-S</b>
			M12 connector		<b>E3F2-DS10B4-M1-S</b>	<b>E3F2-DS10C4-M1-S</b>
	Adjustable sensitivity	pre-wired	0.3 m	<b>E3F2-DS30B4-S</b>	<b>E3F2-DS30C4-S</b>	
				M12 connector	<b>E3F2-DS30B4-M1-S</b>	<b>E3F2-DS30C4-M1-S</b>

**Note:** Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4-S 2M or E3F2-R2RB4-S 5M). For other cable length please contact your OMRON sales representative.

## ■ AC-Switching Models

### Housing material: Plastic

**Note:** Shaded models are normally stocked.

Sensing method		Appearance	Connection method	Sensing distance	Model	
					Light-ON	Dark-ON
Through-beam		 axial	pre-wired	3 m	<b>E3F2-3Z1</b>	<b>E3F2-3Z2</b>
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)	 axial	pre-wired	0.1 - 2 m (with reflector E39-R1)	<b>E3F2-R2Z1</b>	<b>E3F2-R2Z2</b>
Diffuse reflective	Fixed sensing distance Wide-beam characteristics	 axial	pre-wired	0.1 m	<b>E3F2-DS10Z1-N</b>	<b>E3F2-DS10Z2-N</b>

**Note:** Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2Z1 2M or E3F2-R2Z1 5M). For other cable length please contact your OMRON sales representative.

## ■ Accessories (Order Separately)

**Note:** Shaded models are normally stocked.





Name	Sensing distance (typical) [1.]	Model	Remark
Reflectors	0.1 - 3.7 m (axial) 0.1 - 2.4 m (radial)	<b>E39-R1</b>	60 x 40 mm (included in some models)
	0.1 - 4.3 m (axial)	<b>E39-R1S</b>	for E3F2-R4
	0.1 - 4.2 m (axial) 0.1 - 2.7 m (radial)	<b>E39-R7</b>	84 mm
	0.1 - 5.3 m (axial) 0.1 - 3.1 m (radial)	<b>E39-R8</b>	100 x 100 mm
	0.1 - 4.3 m (axial)	<b>E39-R40</b>	80 x 80 mm
Tape Reflectors		<b>E39-RSA</b>	35 x 10 mm
		<b>E39-RSB</b>	35 x 40 mm
		<b>E39-RS3</b>	80 x 70 mm
Lens Cap		<b>E39-F31</b>	
Mounting Bracket		<b>Y92E-B18</b>	screw mount
		<b>Y92E-G18</b>	quick access mounting
Slit		<b>E39-ES18</b>	for E3F2-10□ - precision detection

For detailed information about Accessories, refer to the main chapter “Accessories” at the end of the document.

**Note: 1.** Typical sensing distance corresponds to 80% of the max. sensing distance. For details, please refer to “Engineering Data”.

## ■ Sensor I/O Connectors

**Note:** Shaded models are normally stocked.

Cord	Shape	Cable type		Model
Standard	Straight 	2 m	Four-wire type	<b>XS2F-D421-D80-A</b>
		5 m		<b>XS2F-D421-G80-A</b>
	L-shaped 	2 m		<b>XS2F-D422-D80-A</b>
		5 m		<b>XS2F-D422-G80-A</b>
Vibration-proof robot cable	Straight 	2 m		<b>XS2F-D421-D80-R</b>
		5 m		<b>XS2F-D421-G80-R</b>
	L-shaped 	2 m	<b>XS2F-D422-D80-R</b>	
		5 m	<b>XS2F-D422-G80-R</b>	

# Specifications

## ■ Ratings / Characteristics of DC Switching Models

Item	E3F2-7□	E3F2-10□	E3F2-R2□4-□	E3F2-R2R□	E3F2-R4□-□	E3F2-DS10□	E3F2-DS30□	E3F2-D1□4-□	E3F2-LS10□4-□		
Sensing method	Through-beam - multi purpose - Precision detection [6.] - test input		Retroreflective Non-polarizing			Polarizing		Diffuse reflective Wide beam characteristic			
Power supply voltage	10 to 30 V DC		12 to 24 V DC			10 to 30 V DC					
Current consumption	50 mA max.		25 mA max.		30 mA max.		25 mA max.		30 mA max.		
Rated sensing distance [1.]	7 m	10 m	0.1 - 2 m (with reflector E39-R1)			0.1 - 4 m (with reflector E39-R1S)		0.1 m (5 x 5 cm white mat paper)	0.3 m (10 x 10 cm white mat paper)	1 m (30 x 30 cm white mat paper)	0.1 m (10 x 10 cm white mat paper)
Typical sensing distance for different reflector types (ref. to accessories) [2.]	-		E39-R1: 4.0 m E39-R7: 4.5 m E39-R8: 5.3 m	E39-R1: axial 3.7 m radial 2.4 m E39-R7: axial 4.2 m radial 2.7 m E39-R8: axial 5.3 m radial 3.1 m	E39-R1S: 4.3 m E39-R7: 4.8 m E39-R8: 5.6 m E39-R40: 4.3 m E39-RS3: 2 m		-				
Standard object	Opaque: 11 mm dia. min.		Opaque: 56 mm dia. min.			-					
Directional angle	3° to 20°		-								
Differential travel (hysteresis)	-		20% max.					5% max			
Black/white error	-		3%								
Response time	Operation and Reset: 2.5 ms max.				1 ms max	2.5 ms max.			1 ms max.		
Control output	Transistor (open collector), load current: 100 mA max. (residual voltage: 2 V max.)										
Power reset time	50 ms				100 ms max.		50 ms		100 ms		
Ambient illumination	Incandescent lamp: 3000 lx max. / Sunlight: 10000 lx max.										
Ambient temperature	Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation)										
Ambient humidity	Operating: 35% to 85% / Storage: 35% to 95% (without condensation)										
Insulation resistance	20 MΩ min. at 500 V DC between energized parts and case										
Dielectric strength	1000 VAC max., 50 / 60 Hz for 1 min between energized parts and case										
Vibration resistance	10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z)										
Shock resistance	Destruction: 500 m/s <sup>2</sup> each direction (X, Y, Z)										
Enclosure ratings	IP67 [3.]; NEMA 1, 2, 4										
Light source	Infrared LED (880 nm/850 nm)				Red LED (660 nm)		Infrared LED (880 nm)			Red LED (660 nm)	
Indicators	Light incident / power indicator for light source (red)	Output (orange) / light emission (red)	Light incident / power indicator for light source (red)			Light incident (red) / stability (green)	Light incident / power indicator for light source (red)		Light incident (red) / stability (green)	Output indicator (orange) / stability (green)	
Sensitivity adjustment	Fixed				Fixed / Adjustable		Fixed		Adjustable		Fixed
Connection method	2 m, 5 m pre-wired cable (PVC, dia. 4 mm (18 / 0.12) [4.]) or M12-connector										
Test Input	-		[7.]		-						
Operation mode	Light-ON or Dark-ON selectable by wiring										
Weight (approx.)											
Plastic case	pre-wired (2 m)	120 g		60 g							
	connector	40 g		20 g							
Metal case	pre-wired (2 m)	180 g		90 g							
	connector	120 g		50 g							
Circuit protection	Output short-circuit and power supply reverse polarity										
Housing materials	Plastic (case: ABS; lens: PMMA)										
	Nickel brass	Nickel brass	-		Nickel brass	Nickel brass	Nickel brass	Nickel brass	Nickel brass	Nickel brass	
	Stainless steel [5.]	-	-		Stainless steel [5.]	-	Stainless steel [5.]	Stainless steel [5.]	-	-	

- Note:**
- For stable sensing distance in detail, please refer to "Engineering Data"
  - Typical sensing distance corresponds to 80% of the max. sensing distance.
  - The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter "Precautions")
  - For other cable materials (e.g. PUR) please contact your OMRON sales representative.
  - Material-specification for stainless steel housing case: 1.4305 (W.-No.), 303 (AISI), 2346 (SS). For other stainless steel materials please contact your OMRON sales representative.
  - with slit E39-ES18
  - PNP models -B4:  $V_{CC}$  to  $V_{CC} - 2.5$  V: Emitting OFF (Source current: 3 mA max.) / Open or 0 to 2.5 V: Emitting ON (Leakage current: 0.1 mA max.)  
NPN models -C4: 0 to 2.5 V: Emitting OFF (Source current: 3 mA max.) / Open or  $V_{CC}$  to  $V_{CC} - 2.5$  V: Emitting ON (Leakage current: 0.1 mA max.)

## ■ Ratings / Characteristics of AC Switching Models

Item	E3F2-3Z1 E3F2-3Z2	E3F2-R2Z1 E3F2-R2Z2	E3F2-DS10Z1 E3F2-DS10Z2
Sensing method	Through-beam	Non-polarizing Retroreflective	Diffuse reflective (wide-beam characteristic)
Power supply voltage	24 to 240 VAC ±10%, 50 / 60 Hz		
Current consumption	10 mA max.	5 mA max.	
Rated sensing distance[1.]	3 m	0.1 - 2 m (with reflector E39-R1)	0.1 m (5 x 5 cm white mat paper)
Typical sensing distance for different reflector types [2.]	–	E39-R1: 3,4 m E39-R7: 3,9 m E39-R8: 5,2 m	–
Detectable object	Opaque object: 11 mm min.	Opaque object: 56 mm min.	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		
Power reset time	100 ms		
Ambient illumination	Incandescent lamp: 3000 lx max. Sunlight: 10000 lx max.		
Ambient temperature	Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation)		
Ambient humidity	Operating: 35% to 85% / Storage: 35% to 95% (without condensation)		
Insulation resistance	20 MΩ min. at 500 V DC between energized parts and case		
Dielectric strength	1500 VAC, 50 / 60 Hz for 1 min between energized parts and case		
Vibration resistance	10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z)		
Shock resistance	500 m/sqr (approx. 50 g) for each direction (X, Y, Z)		
Enclosure rating	IP67 [3.]; NEMA 1, 2, 4		
Light source	Infrared LED (880 nm)		
Indicators	Light incident/power indicator for light source (red)		
Sensitivity adjustment	Fixed		
Connection method	2 m, 5 m pre-wired cable (PVC dia. 4 mm (14 / 0.15))		
Operation mode	Light-ON or Dark-ON (fixed)		
Circuit protection	None		
Weight (approx.)	110 g (pre-wired 2 m cable)		
Housing materials	Plastic (case: ABS; lens: PMMA)		

- Note:**
1. For stable sensing distance in detail, please refer to “Engineering Data”
  2. Typical sensing distance corresponds to 80% of the max. sensing distance.
  3. The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter “Precautions”)