

E3F Series Photoelectric Sensor Manual

Product Overview

This product is suitable for various control functions, including machine tool limit detection, object sensing, counting, speed measurement, liquid level monitoring, and providing positioning signals in automated production lines. Widely utilized across industries such as machinery, mining, metallurgy, plastics, textiles, tobacco, electric power, railways, and the defense sector.

For your safety, please read the following information before use.

Safety Precautions

※ "Safety Precautions" are provided to ensure the safe and proper use of the product, as well as to prevent accidents and hazards. Please strictly adhere to these guidelines.

※ The terms "Warning" and "Caution" within the "Safety Precautions" section are defined as follows:

⚠ **Warning:** Failure to operate according to these instructions may result in serious injury or death.

⚠ **Caution:** Failure to operate according to these instructions may result in minor injury or damage to the product.

※ The symbols used on the product and within this instruction manual are explained below:

⚠ Indicates a potential hazard under specific conditions.

Warning

1. When using this product in critical applications involving significant risks to human life or property (e.g., nuclear control systems, medical equipment, vehicles, railways, aviation, flammable material handling systems, amusement park facilities, or safety devices), **dual safety measures must be implemented.

Failure to do so may result in fire, personal injury, or property damage.

Caution

1. Strictly prohibit using this product in environments containing flammable or explosive gases, chemical substances, strong acids, or strong bases.

Failure to observe this may result in fire or explosion.

2. Strictly prohibit stamping this product.

Failure to observe this may result in product damage or malfunction.

3. Strictly prohibit operating this product outside its specified voltage range or using an AC power supply.

Failure to observe this may result in product damage or malfunction.

Model description

E3F	-	DS	□	-	□
Cylinder photoelectric sensor		Diffuse reflective	Detection Distance		Operating Form And Supply Voltage
			5: 5cm		C4: NPN NO 6-36VDC
			10: 10cm		C4-5V: NPN NO 5VDC
			30: 30cm		C2: NPN NC 6-36VDC
			50: 50cm		C12: NPN NO+NC 6-36VDC
			70: 70cm		P1: PNP NO 6-36VDC
			100: 100cm		P2: PNP NC 6-36VDC
					P12: PNP NO+NC 6-36VDC
					Y1: Two wires NO 90-250VAC
					Y2: Two wires NC 90-250VAC

E3F	-	R	□	-	□
Cylinder photoelectric sensor		Retroreflective	Detection Distance		Operating Form And Supply Voltage
			2: 2m		N1: NPN NO 6-36VDC
			4: 4m		N2: NPN NC 6-36VDC
					P1: PNP NO 6-36VDC
					P2: PNP NC 6-36VDC
					Y1: Two wires NO 90-250VAC
					Y2: Two wires NC 90-250VAC

- E3F - - -
- Cylinder photoelectric sensor
 - None: Through beam
 - Detection Distance
 - 5D: 5m
 - 10D: 10m
 - Operating Form And Supply Voltage
 - N1: NPN NO 6-36VDC
 - N2: NPN NC 6-36VDC
 - P1: PNP NO 6-36VDC
 - P2: PNP NC 6-36VDC
 - Y1: Two wires NO 90-250VAC
 - Y2: Two wires NC 90-250VAC

Control output circuit diagram and load action

NPN			NO		NC			
		Detected Object	Yes	No	Yes	No		
		Load (Brown-Black)	Action	Reset	Action	Reset		
		Output voltage (Black-Blue)	H	L	H	L		
PNP			NO		NC			
		Detected Object	Yes	No	Yes	No		
		Load (Black-Blue)	Action	Reset	Action	Reset		
		Output voltage (Brown-Black)	H	L	H	L		
NPN NO+NC			NO+NC					
		Detected Object	Yes	No	Yes	No		
		Load (Brown-Black) (White-Black)	Action	Reset	Action	Reset		
		Output voltage (Black-Blue)	H	L	H	L		
PNP NO+NC			NO+NC					
		Detected Object	Yes	No	Yes	No		
		Load (Brown-Black) (White-Black)	Action	Reset	Action	Reset		
		Output voltage (Black-Blue)	H	L	H	L		
DC Two wires			NO		NC			
		Detected Object	Yes	No	Yes	No		
		Load	Action	Reset	Action	Reset		
		Output voltage	H	L	H	L		
AC Two wires			NO		NC			
		Detected Object	Yes	No	Yes	No		
		Load	Action	Reset	Action	Reset		
		Output voltage	H	L	H	L		
			ON	OFF		ON	OFF	

■ Infrared Photoelectric Sensor Types

1. Diffuse Reflection Type: A modulated infrared beam emitted by the photoelectric sensor is reflected back by the object being detected. This reflected infrared light is received via synchronous gating, and the sensor's electronic circuitry drives an output loop to determine the presence or absence of an object. This type is simple and convenient to use, making it the most widely adopted configuration. (See Figure 1)

2. Retro-reflection Type: An infrared beam emitted by the photoelectric sensor is reflected back by a reflector (positioned within the sensor's operating range) and received by the sensor. Typically, the sensor output switches from a high level to a low level in this state. When an object enters the optical axis and interrupts the beam, the sensor output switches from a low level back to a high level, thereby achieving the detection objective. This type offers a longer detection distance compared to the diffuse reflection type. (See Figure 2)

3. Through-beam Type: This configuration consists of a separate emitter (light source) and receiver (light detector) unit. The presence or absence of an object is determined by whether it interrupts the aligned optical axis between the emitter and the receiver. This type offers the longest detection distance and the highest sensitivity. On the label of the receiving unit (detector), a " ↓ " symbol indicates the receiving end; on the label of the emitting unit (emitter), an " ↑ " symbol indicates the transmitting end. Please carefully identify the receiving and emitting units before proceeding with the wiring connections. (See Figure 3)

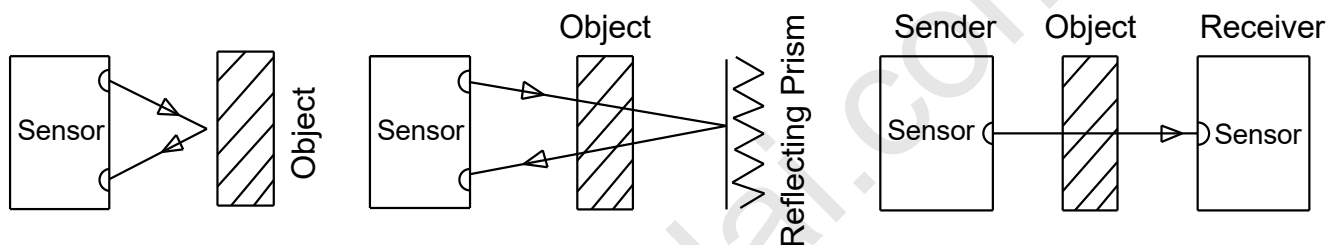


Figure 1: Diffuse reflective

Figure 2: Retroreflective

Figure 3: Through beam

■ Main Technical Parameters

Operating Environment: Operating Temperature: -25°C to 65°C ; Storage Temperature: -40°C to 70°C .

Protection Rating (IP Code): IP61 – IP67.

Detectable Objects: Transparent and opaque objects.

Differential Distance (Hysteresis): Less than 20% of the detection distance.

Dielectric Strength (Withstand Voltage): DC 1.5kV (for 60s); AC 2kV (for 60s).

Insulation Resistance: $\geq 20 \text{ M}\Omega$ (at DC 500V).

■ Precautions

1. Before powering on the sensor, always verify that the wiring connections are correct and confirm that the supply voltage matches the rated voltage value.
2. The sensor's output load must not be short-circuited. The current drawn by the load must not exceed the sensor's maximum output current capacity.

■ Functions and Proper Usage of Photoelectric Sensors

The surface color (reflectivity) and size of a detected object influence the sensor's detection distance and operating range. When utilizing a reflective-type photoelectric sensor, the surface color and dimensions of the object being detected directly affect both the detection distance and the effective operating area.

1. Object Size and Detection Distance

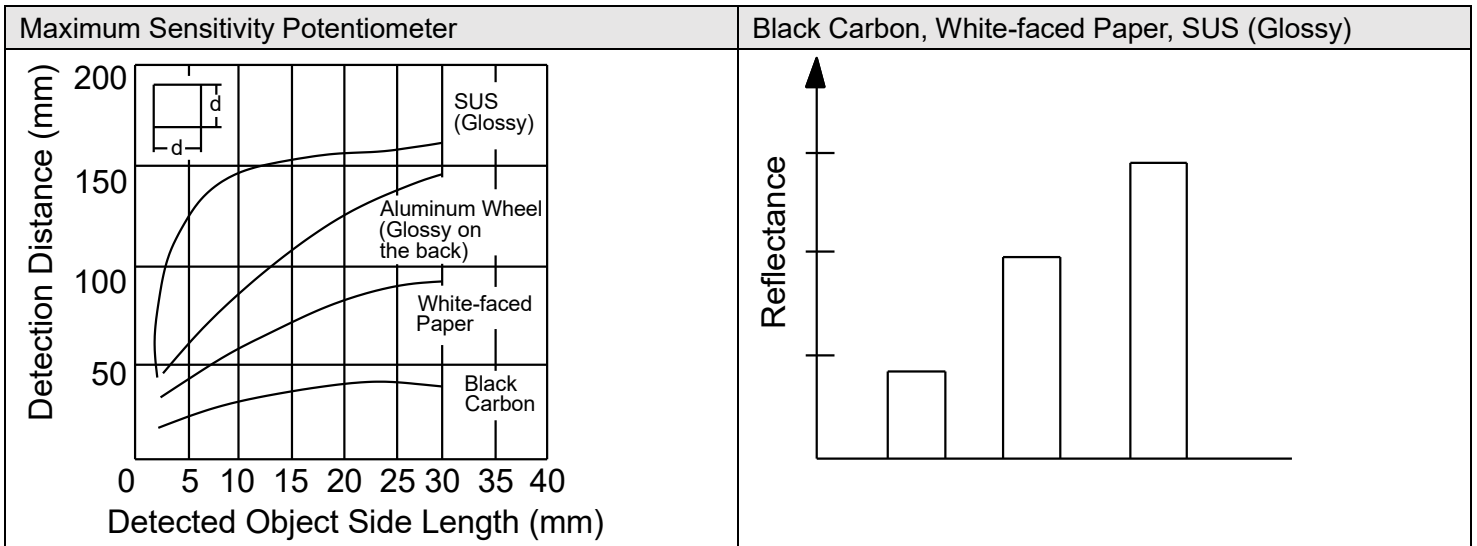
As illustrated in Figure 4, when detecting objects—particularly very small ones—the achievable detection distance is typically shorter compared to when detecting larger objects.

2. Object Surface Characteristics and Detection Distance

As shown in Figure 5, the higher the reflectivity of the object's surface, the greater the achievable detection distance.

3. Relationship Between Minimum Detectable Object Size and Lens Diameter

When utilizing a through-beam photoelectric sensor, the minimum size of the object that can be detected is determined by the diameter of the sensor's lens.



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