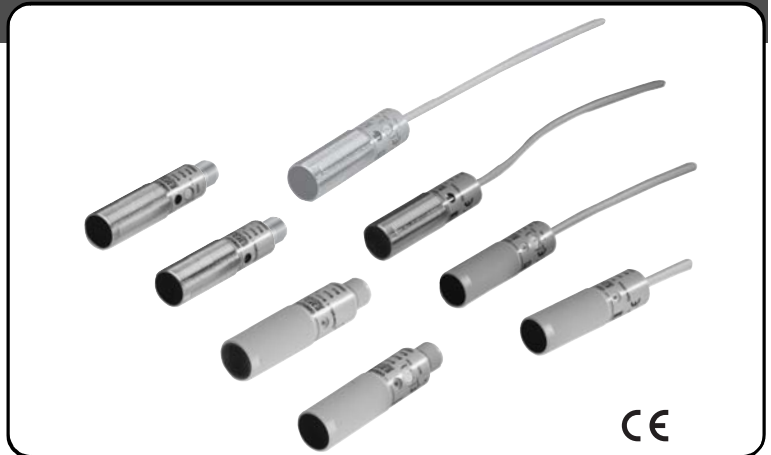


# Photoelectric Sensor E3F3

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

**High Noise-immunity with Photo-IC Technology**

- Up-to-date photo-IC to increase noise immunity.
- M18 DIN-sized cylindrical housing, ABS resin case.
- Long sensing distance (30 cm) with sensitivity adjuster for diffuse type.
- Short-circuit and reverse connection protection.



**<READ AND UNDERSTAND THIS CATALOG>**

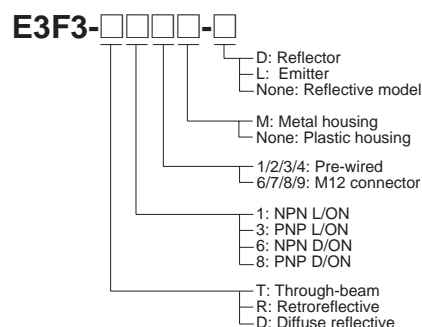
Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Ordering Information

Infrared light  Red light

Sensing method	Appearance	Connection method	Sensing distance	Operating modes		Model			
						Plastic housing		Metal housing	
						NPN output	PNP output	NPN output	PNP output
Through-beam		Pre-wired M12 CN	5 m	Light-ON		E3F3-T11	E3F3-T31	E3F3-T11M	E3F3-T31M
						E3F3-T16	E3F3-T36	E3F3-T16M	E3F3-T36M
		Pre-wired M12 CN	5 m	Dark-ON		E3F3-T61	E3F3-T81	E3F3-T61M	E3F3-T81M
						E3F3-T66	E3F3-T86	E3F3-T66M	E3F3-T86M
Retro-reflective		Pre-wired M12 CN	3 m	Light-ON	Non-polarized	E3F3-R11	E3F3-R31	E3F3-R11M	E3F3-R31M
						E3F3-R16	E3F3-R36	E3F3-R16M	E3F3-R36M
				Dark-ON		E3F3-R61	E3F3-R81	E3F3-R61M	E3F3-R81M
						E3F3-R66	E3F3-R86	E3F3-R66M	E3F3-R86M
		Pre-wired M12 CN	2 m	Light-ON	Polarized	E3F3-R12	E3F3-R32	E3F3-R12M	E3F3-R32M
						E3F3-R17	E3F3-R37	E3F3-R17M	E3F3-R37M
				Dark-ON		E3F3-R62	E3F3-R82	E3F3-R62M	E3F3-R82M
						E3F3-R67	E3F3-R87	E3F3-R67M	E3F3-R87M
Diffuse reflective		Pre-wired M12 CN	100 mm	Light-ON		E3F3-D11	E3F3-D31	E3F3-D11M	E3F3-D31M
						E3F3-D16	E3F3-D36	E3F3-D16M	E3F3-D36M
				Dark-ON		E3F3-D61	E3F3-D81	E3F3-D61M	E3F3-D81M
						E3F3-D66	E3F3-D86	E3F3-D66M	E3F3-D86M
		Pre-wired M12 CN	300 mm	Light-ON		E3F3-D12	E3F3-D32	E3F3-D12M	E3F3-D32M
						E3F3-D17	E3F3-D37	E3F3-D17M	E3F3-D37M
				Dark-ON		E3F3-D62	E3F3-D82	E3F3-D62M	E3F3-D82M
						E3F3-D67	E3F3-D87	E3F3-D67M	E3F3-D87M

## Model Number Legend



## Accessories (Order Separately)

Name	Model
Reflector	E39-R1, E39-R3
Reflector (tape type)	E39-RS1, E39-RS2, E39-RS3
Lens Cap	E39-F31
Mounting Bracket	Y92E-B18

Note: E39-R1 is included in E3F3-R□□□ and E3F3-R□□□M.

## Specifications

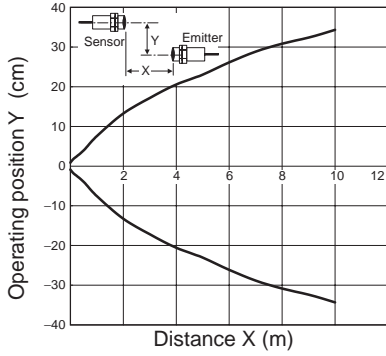
### Ratings/Characteristics

Item	Sensing method	Through-beam		Retroreflective		Diffuse reflective		
		E3F3-T11	E3F3-T16	E3F3-R11	E3F3-R12	E3F3-D11	E3F3-D12	
	NPN output	E3F3-T61	E3F3-R61	E3F3-R16	E3F3-R17	E3F3-D16	E3F3-D17	
		E3F3-T66	E3F3-R66	E3F3-R67	E3F3-R67	E3F3-D66	E3F3-D66	
		PNP output	E3F3-T31	E3F3-R31	E3F3-R32	E3F3-R32	E3F3-D31	E3F3-D32
			E3F3-T36	E3F3-R36	E3F3-R37	E3F3-R37	E3F3-D36	E3F3-D37
		E3F3-T81	E3F3-R81	E3F3-R82	E3F3-R82	E3F3-D81	E3F3-D82	
		E3F3-T86	E3F3-R86	E3F3-R87	E3F3-R87	E3F3-D86	E3F3-D87	
Sensing distance		5 m	3 m (Non-polarized when using E39-R1)	2 m (Non-polarized when using E39-R1)	100 mm	300 mm		
Standard sensing object		Opaque object: 11 mm min.	Opaque object: 56 mm min.		100 × 100 mm white mat paper			
Hysteresis		---			20% max. of sensing distance			
Light source (wavelength)		Infrared LED (860 nm)	Red LED (680 nm)		Infrared LED (860 nm)			
Power supply voltage		12 to 24 VDC±10%, ripple (p-p): 10% max.						
Current consumption		45 mA max. (light source and receiver)	25 mA max.					
Control output		Open collector transistor output, 100 mA max., residual voltage: 1 V max. at 100 mA						
Protective circuit		Output short-circuit protection, DC power supply reverse polarity protection						
Response time		1.0 ms max.						
Sensitivity adjustment		---					Single-turn adjuster	
Ambient illumination		Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.						
Ambient temperature		Operating: -25 to 55 °C (with no icing or condensation) Storage: -30 to 70 °C (with no icing or condensation)						
Ambient humidity		Operating: 45% to 85% (with no condensation) Storage: 35% to 95% (with no condensation)						
Insulation resistance		20 MΩ min. (at 500 VDC) between current carry parts and case						
Dielectric strength		1,000 VAC at 50/60 Hz for 1 min between current carry parts and case						
Vibration resistance (destruction)		10 to 55 Hz, 1.5-mm double amplitude for 1 hour each in X, Y, and Z directions						
Shock resistance (destruction)		500 m/s <sup>2</sup> for 3 times each in X, Y, and Z directions						
Degree of protection		IEC 60529 IP66						
Connecting method		Pre-wired (standard length: 2 m)/M12 connector						
Indicators		Operation indicator (orange) [Power indicator of emitter (orange)]						
Weight	Pre-wired	Metal: 200 g max.		Metal housing: 100 g max.				
		Plastic: 170 g max.		Plastic housing: 85 g max.				
	M12 connector	Metal: 120 g max.		Metal housing: 60 g max.				
		Plastic: 40 g max.		Plastic housing: 20 g max.				
Packing		Nylon bag						
Material	Case	Plastic: ABS, Metal: Nickel-brass						
	Lens	PMMA						
	Accessories	Screw nuts: ABS or Nickel-brass						
Accessories		Screw nuts (4), Instruction sheet	Screw nuts (2), E39-R1 reflector, Instruction sheet	Screw nuts (2), Instruction sheet	Screw nuts (2), Instruction sheet, Adjusting driver			

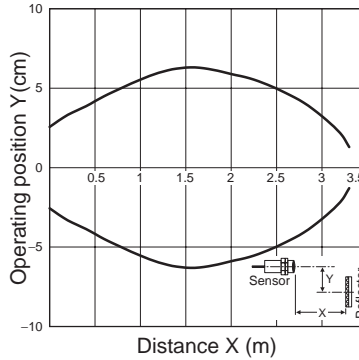
# Engineering Data

## Parallel Operating Range (Typical)

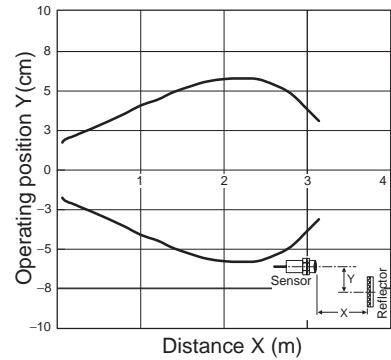
**Through-beam Models**  
E3F3-T□1□/T□6□



**Retroreflective Models**  
E3F3-R□1□/R□6□+E39-R1

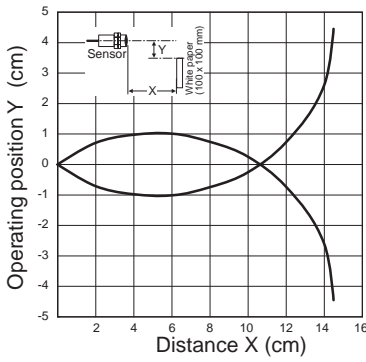


**Retroreflective Models**  
E3F3-R□2□/R□7□+E39-R1

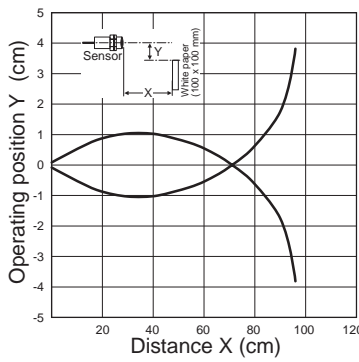


## Operating Range (Typical)

**Diffuse-reflective Models**  
E3F3-D□1□/D□6□

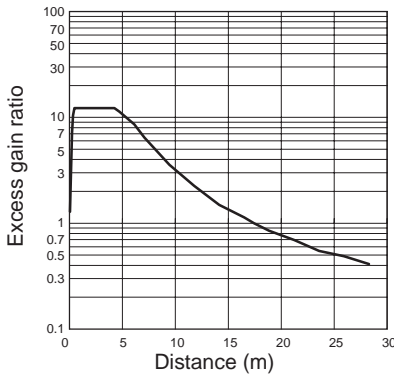


**Diffuse-reflective Models**  
E3F3-D□2□/D□7□

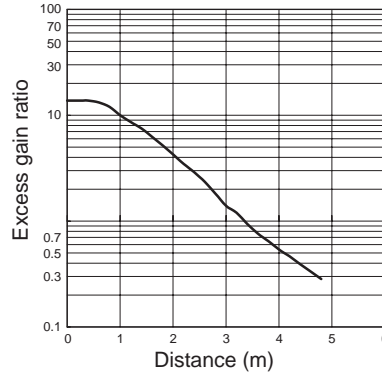


## Excess Gain Ratio vs. Set Distance (Typical)

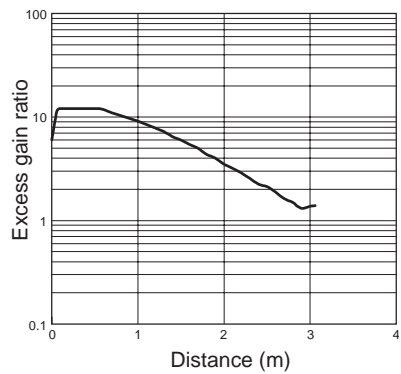
**Through-beam Models**  
E3F3-T□1□/T□6□



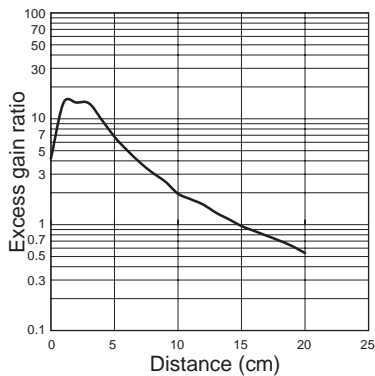
**Retroreflective Models**  
E3F3-R□1□/R□6□+E39-R1



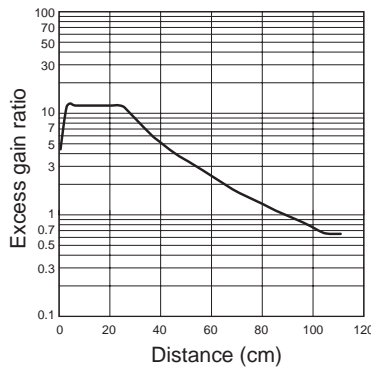
**Retroreflective Models**  
E3F3-R□2□/R□7□+E39-R1



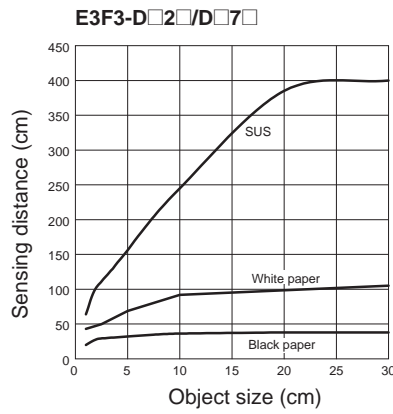
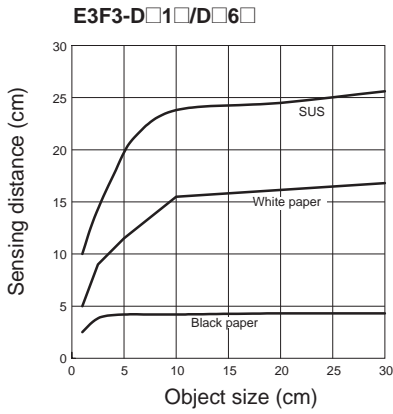
**Diffuse-reflective Models**  
E3F3-D□1□/D□6□



**Diffuse-reflective Models**  
E3F3-D□2□/D□7□



Sensing Distance vs. Object Size (Typical)



Operation

■ NPN Output

Model	Output transistor status	Timing chart	Output circuit
E3F3-T1 E3F3-R1 E3F3-D1	Light-ON	<p>Incident light: ON (High), No incident light: OFF (Low)</p> <p>Operation indicator (orange): ON (High), OFF (Low)</p> <p>Control output: ON (High), OFF (Low)</p> <p>Load (relay): Operate (High), Release (Low) (Between brown and black)</p>	
E3F3-T6 E3F3-R6 E3F3-D6	Dark-ON	<p>Incident light: ON (High), No incident light: OFF (Low)</p> <p>Operation indicator (orange): ON (High), OFF (Low)</p> <p>Control output: ON (High), OFF (Low)</p> <p>Load (relay): Operate (High), Release (Low) (Between brown and black)</p>	

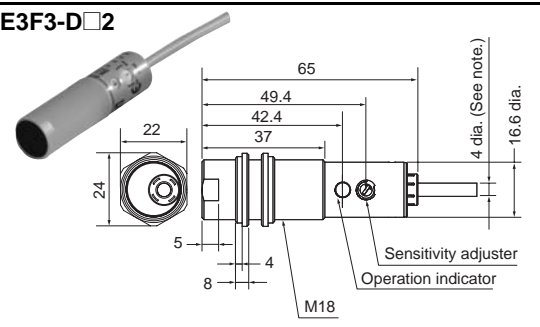
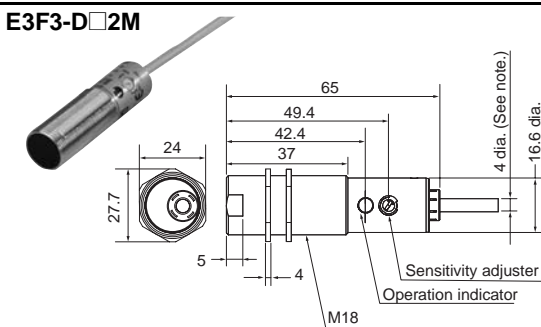
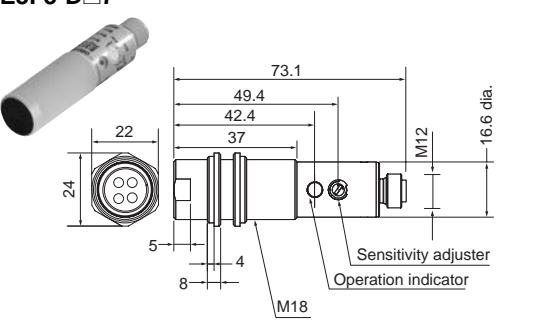
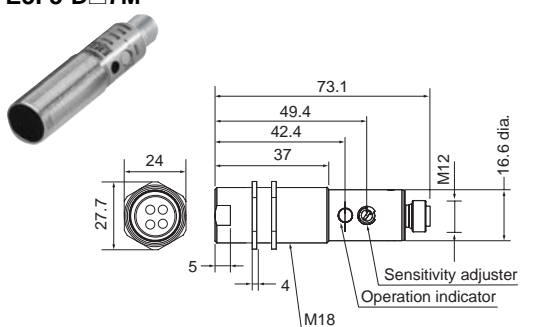
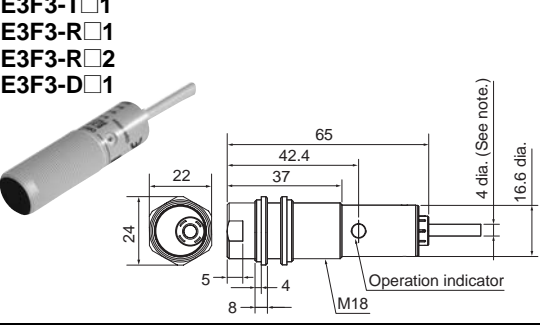
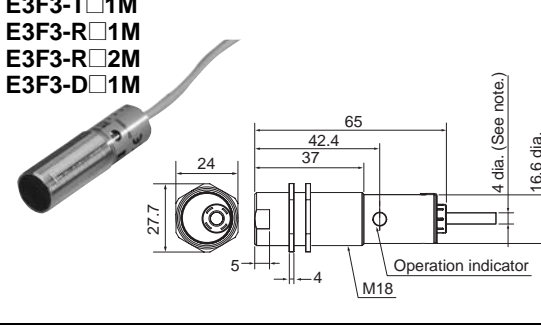
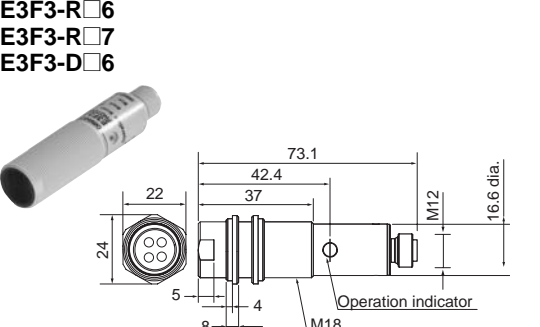
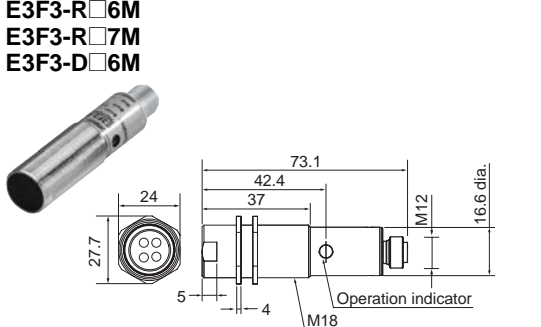
■ PNP Output

Model	Output transistor status	Timing chart	Output circuit
E3F3-T3 E3F3-R3 E3F3-D3	Light-ON	<p>Incident light: ON (High), No incident light: OFF (Low)</p> <p>Operation indicator (orange): ON (High), OFF (Low)</p> <p>Control output: ON (High), OFF (Low)</p> <p>Load (relay): Operate (High), Release (Low) (Between blue and black)</p>	
E3F3-T8 E3F3-R8 E3F3-D8	Dark-ON	<p>Incident light: ON (High), No incident light: OFF (Low)</p> <p>Operation indicator (orange): ON (High), OFF (Low)</p> <p>Control output: ON (High), OFF (Low)</p> <p>Load (relay): Operate (High), Release (Low) (Between blue and black)</p>	

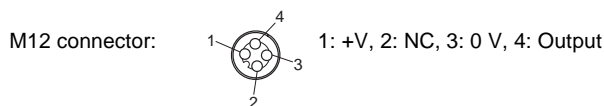
# Dimensions

Note: All units are in millimeters unless otherwise indicated.

## Sensors

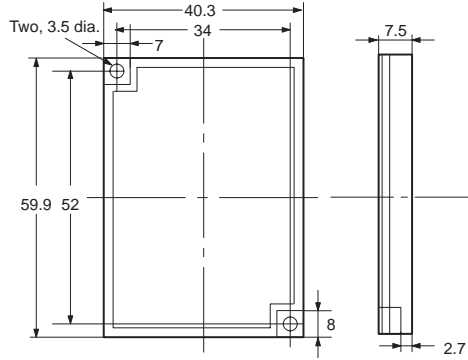
	Plastic housing	Metal housing
Pre-wired	<b>E3F3-D□2</b>  <p>Dimensions: 65 (total length), 49.4 (to sensitivity adjuster), 42.4 (to operation indicator), 37 (to M18), 24 (housing diameter), 22 (cord diameter), 5 (cord length), 8 (to M18), 4 (to operation indicator), 4 dia. (See note.) (operation indicator diameter), 16.6 dia. (housing diameter).</p> <p>Labels: Sensitivity adjuster, Operation indicator, M18.</p>	<b>E3F3-D□2M</b>  <p>Dimensions: 65 (total length), 49.4 (to sensitivity adjuster), 42.4 (to operation indicator), 37 (to M18), 24 (housing diameter), 27.7 (cord diameter), 5 (cord length), 4 (to operation indicator), 4 dia. (See note.) (operation indicator diameter), 16.6 dia. (housing diameter).</p> <p>Labels: Sensitivity adjuster, Operation indicator, M18.</p>
M12 connector	<b>E3F3-D□7</b>  <p>Dimensions: 73.1 (total length), 49.4 (to sensitivity adjuster), 42.4 (to operation indicator), 37 (to M18), 24 (housing diameter), 22 (cord diameter), 5 (cord length), 8 (to M18), 4 (to operation indicator), 16.6 dia. (housing diameter).</p> <p>Labels: Sensitivity adjuster, Operation indicator, M18, M12.</p>	<b>E3F3-D□7M</b>  <p>Dimensions: 73.1 (total length), 49.4 (to sensitivity adjuster), 42.4 (to operation indicator), 37 (to M18), 24 (housing diameter), 27.7 (cord diameter), 5 (cord length), 4 (to operation indicator), 16.6 dia. (housing diameter).</p> <p>Labels: Sensitivity adjuster, Operation indicator, M18, M12.</p>
Pre-wired	<b>E3F3-T□1</b> <b>E3F3-R□1</b> <b>E3F3-R□2</b> <b>E3F3-D□1</b>  <p>Dimensions: 65 (total length), 42.4 (to operation indicator), 37 (to M18), 24 (housing diameter), 22 (cord diameter), 5 (cord length), 8 (to M18), 4 (to operation indicator), 4 dia. (See note.) (operation indicator diameter), 16.6 dia. (housing diameter).</p> <p>Labels: Operation indicator, M18.</p>	<b>E3F3-T□1M</b> <b>E3F3-R□1M</b> <b>E3F3-R□2M</b> <b>E3F3-D□1M</b>  <p>Dimensions: 65 (total length), 42.4 (to operation indicator), 37 (to M18), 24 (housing diameter), 27.7 (cord diameter), 5 (cord length), 4 (to operation indicator), 4 dia. (See note.) (operation indicator diameter), 16.6 dia. (housing diameter).</p> <p>Labels: Operation indicator, M18.</p>
M12 connector	<b>E3F3-T□6</b> <b>E3F3-R□6</b> <b>E3F3-R□7</b> <b>E3F3-D□6</b>  <p>Dimensions: 73.1 (total length), 42.4 (to operation indicator), 37 (to M18), 24 (housing diameter), 22 (cord diameter), 5 (cord length), 8 (to M18), 4 (to operation indicator), 16.6 dia. (housing diameter).</p> <p>Labels: Operation indicator, M18, M12.</p>	<b>E3F3-T□6M</b> <b>E3F3-R□6M</b> <b>E3F3-R□7M</b> <b>E3F3-D□6M</b>  <p>Dimensions: 73.1 (total length), 42.4 (to operation indicator), 37 (to M18), 24 (housing diameter), 27.7 (cord diameter), 5 (cord length), 4 (to operation indicator), 16.6 dia. (housing diameter).</p> <p>Labels: Operation indicator, M18, M12.</p>

Note: Pre-wired Cord: Polyvinyl chloride-covered cord, 4-mm dia. (18/0.12), Standard length: 2 m  
 Emitter: 2-conductor (brown and blue)  
 Receiver and Reflective model: 3-conductor (brown, blue, and black)

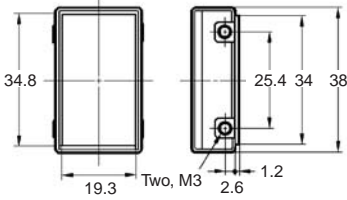
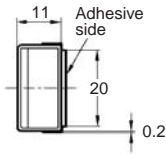


■ Accessories (Order Separately)

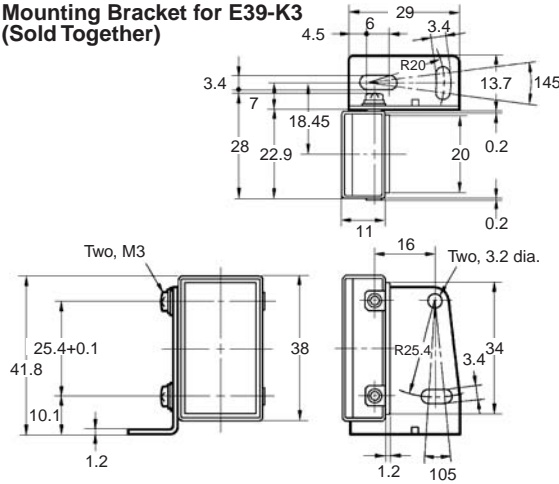
E39-R1 Retroreflector



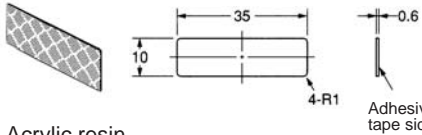
E39-R3 Retroreflector



Mounting Bracket for E39-K3 (Sold Together)

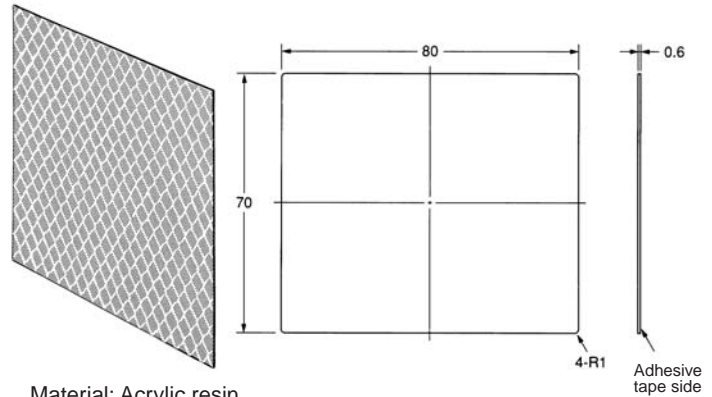


E39-RS1 Retroreflector



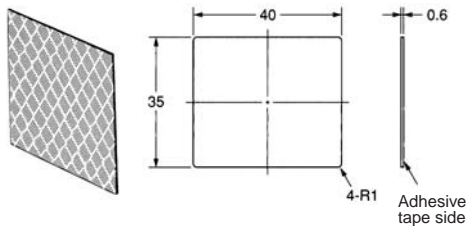
Material: Acrylic resin

E39-RS3 Retroreflector



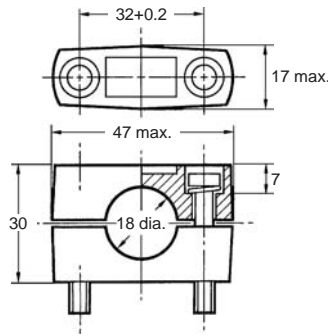
Material: Acrylic resin

E39-RS2 Retroreflector



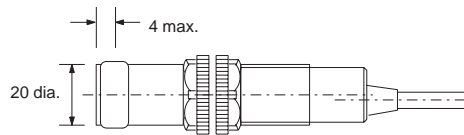
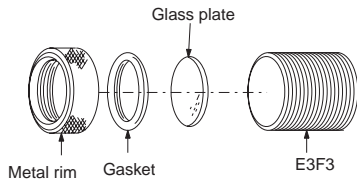
Material: Acrylic resin

**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.

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

## Mounting

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



**⚠ WARNING**

The E3F3 Photoelectric sensor is not a safety component for ensuring the safety of people as defined by EC Directives (91/386 EEC) and covered by separate European standards or by any other regulations or standards.

## **READ AND UNDERSTAND THIS DOCUMENT**

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

## **WARRANTY**

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

## **LIMITATIONS OF LIABILITY**

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## **SUITABILITY FOR USE**

THE PRODUCTS CONTAINED IN THIS DOCUMENT ARE NOT SAFETY RATED. THEY ARE NOT DESIGNED OR RATED FOR ENSURING SAFETY OF PERSONS, AND SHOULD NOT BE RELIED UPON AS A SAFETY COMPONENT OR PROTECTIVE DEVICE FOR SUCH PURPOSES. Please refer to separate catalogs for OMRON's safety rated products.

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the product.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

## **PERFORMANCE DATA**

Performance data given in this document is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

## **CHANGE IN SPECIFICATIONS**

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

## **DIMENSIONS AND WEIGHTS**

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

## **ERRORS AND OMISSIONS**

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

## **PROGRAMMABLE PRODUCTS**

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

## **COPYRIGHT AND COPY PERMISSION**

This document shall not be copied for sales or promotions without permission.

This document is protected by copyright and is intended solely for use in conjunction with the product. Please notify us before copying or reproducing this document in any manner, for any other purpose. If copying or transmitting this document to another, please copy or transmit it in its entirety.

**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. E365-E1-01

**In the interest of product improvement, specifications are subject to change without notice.**

## **OMRON Corporation**

Industrial Automation Company

Sensing Devices Division H.Q.

Industrial Sensors Division

Shiokoji Horikawa, Shimogyo-ku,

Kyoto, 600-8530 Japan

Tel: (81)75-344-7022/Fax: (81)75-344-7107

Printed in Japan

0605-?M (0605) (?)