


# EE-SPZ301/401

## Use standard optical fiber.


- Photomicrosensor with light modulation for reduced external light interference.
- Easy adjustment and operation validation with an operation indicator (lights when light is incident).
- Wide operating voltage range: 5 to 24 VDC
- Supports connection with Programmable Controllers (PLCs).
- Easy-to-wire connectors assure easy maintenance.



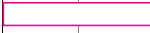


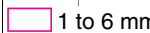
 Be sure to read *Safety Precautions* on page 5.

## Ordering Information

 Infrared light

Appearance	Application	Output configuration	Model
	Fiber connection	Dark-ON	<b>EE-SPZ301</b>
		Light-ON	<b>EE-SPZ401</b>

## Fiber Unit and Attachment Combinations

Model	Fiber Unit	Attachment	Sensing distance	Sensing object	Directional angle
(Fiber connection) <b>EE-SPZ301</b> <b>EE-SPZ401</b>	(Through-beam) E32-TC200	---	 20 mm	Opaque: 1 mm dia.	5 to 40°
		(Lens) E39-F1	 150 mm	Opaque: 4 mm dia. min.	
		(Side-view) E39-F2	 10 mm	Opaque: 3 mm dia. min.	20 to 60°
	(Reflective) E32-DC200	---	 1 to 6 mm	White paper: 15×15 mm	---

Note 1. The sensing distance given is a reference value applicable only when the fiber length is 60 cm. (Refer to the engineering data for the relationship between fiber length and sensing distance.)

2. Ambient operating temperature of Fiber section: -40 to 70°C, Attachment: -40 to 200°C, Retroreflector: -40 to 70°C

3. Ambient humidity: 5% to 85%

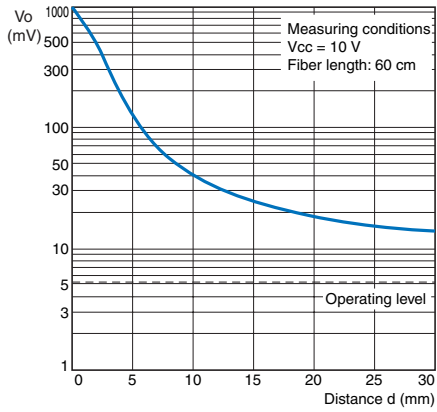
## Ratings and Specifications

Item	Models	EE-SPZ301, EE-SPZ401
Power supply voltage		5 to 24 VDC $\pm$ 10%, ripple (p-p): 5% max.
Current consumption		Average: 15 mA max., Peak: 50 mA max.
Response frequency		100 Hz
Control output		5 to 24 VDC 80 mA load current with a residual voltage of 1.0 V max. 10 mA load current with a residual voltage of 0.4 V max.
Light source		GaAs infrared LED (pulse lighting) with a peak wavelength of 940 nm
Indicator		Light indicator (red)
Light-receiving element		Si photodiode (Maximum sensitivity wavelength: 850 nm)
Ambient illumination		3,000 lx max. with incandescent light or sunlight on the surface of the receiver
Degree of protection		IEC Standard IP50 (excluding terminal section.)
Ambient temperature		Operating: $-10$ to $+55^{\circ}\text{C}$ Storage: $-25$ to $+65^{\circ}\text{C}$
Ambient humidity		Operating: 5% to 85% Storage: 5% to 95%
Permissible bending radius of Fiber Unit		25 mm
Maximum fiber length		Through-beam: 180 cm Reflective: 100 cm
Vibration resistance		Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 h 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
Cable		2 m max. (Thickness: AWG24 min.)
Weight		Approx. 3.0 g

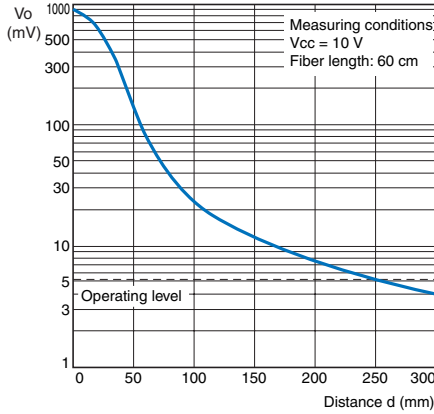
Engineering Data (Typical)

Receiver Output vs. Sensing Distance Characteristics

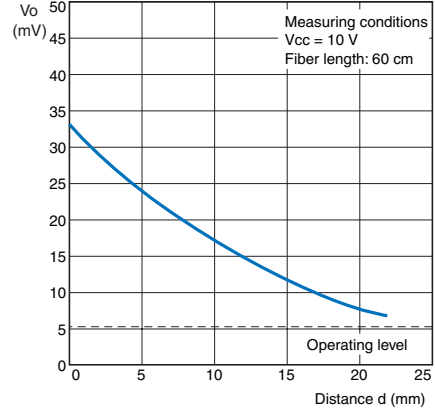
EE-SPZ301 } + E32-TC200  
EE-SPZ401 }



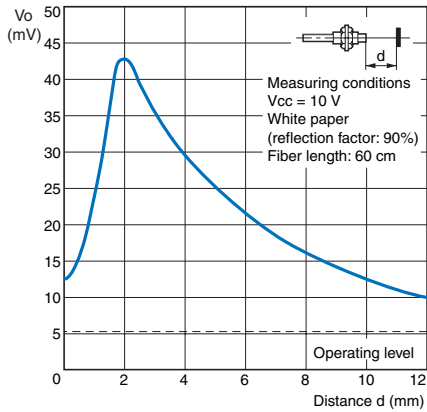
EE-SPZ301 } + E32-TC200  
EE-SPZ401 } + E39-F1



EE-SPZ301 } + E32-TC200  
EE-SPZ401 } + E39-F2

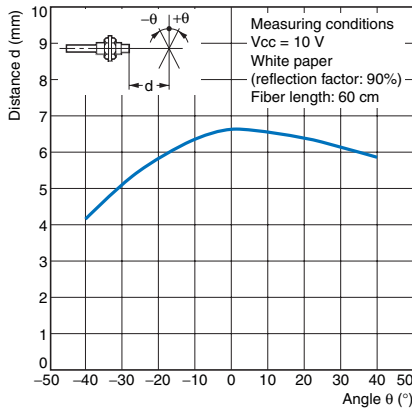


EE-SPZ301 } + E32-DC200  
EE-SPZ401 }



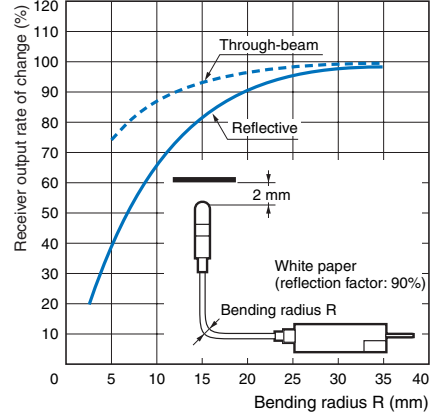
Sensing Angle Characteristics

EE-SPZ301 } + E32-DC200  
EE-SPZ401 }



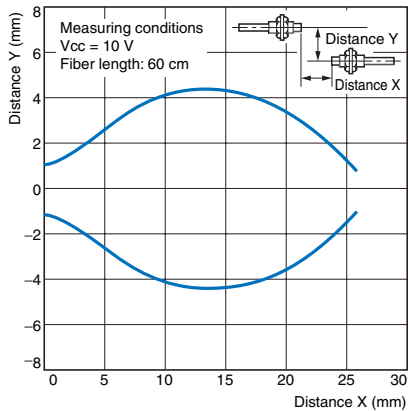
Receiver Output vs. Bending Radius

EE-SPZ301Y-01  
EE-SPZ401Y-01

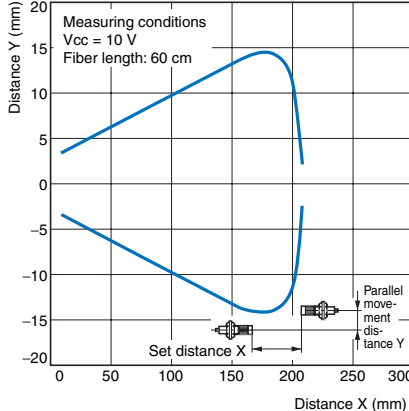


Sensing Position Characteristics

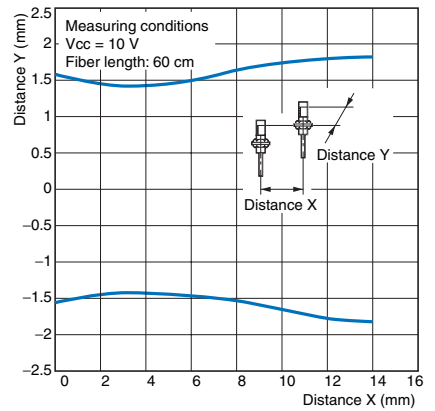
EE-SPZ301 } + E32-TC200  
EE-SPZ401 }



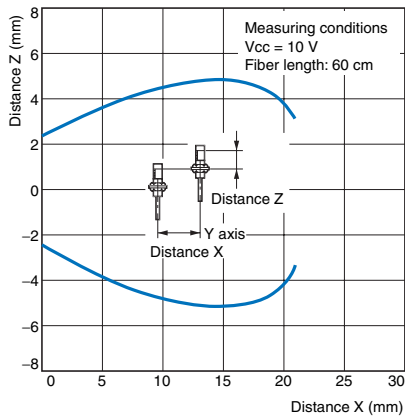
EE-SPZ301 } + E32-TC200  
EE-SPZ401 } + E39-F1



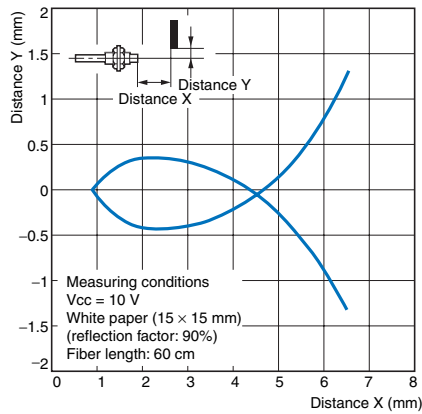
EE-SPZ301 } + E32-TC200  
EE-SPZ401 } + E39-F2



EE-SPZ301 } + E32-TC200  
EE-SPZ401 } + E39-F2

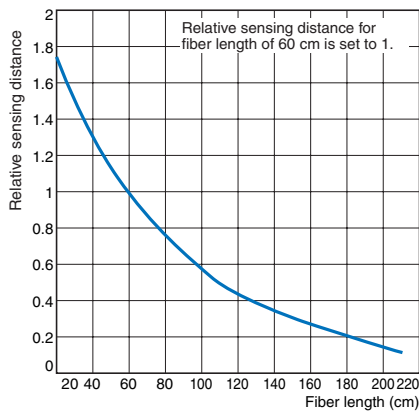


EE-SPZ301 } + E32-DC200  
EE-SPZ401 } + E32-DC200

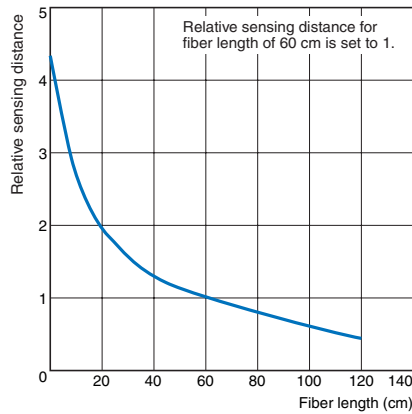


Fiber Length vs. Relative Sensing Distance Characteristics

EE-SPZ301 } + E32-TC200  
EE-SPZ401 } + E32-TC200



EE-SPZ301 } + E32-DC200  
EE-SPZ401 } + E32-DC200



I/O Circuit Diagrams

Model	Output configuration	Timing charts	Output circuit
EE-SPZ401	Light-ON	<p>Incident: [ON]</p> <p>Interrupted: [OFF]</p> <p>Light indicator (red): ON [ON], OFF [OFF]</p> <p>Output transistor: ON [ON], OFF [OFF]</p> <p>Load 1 (relay): Operates [ON], Releases [OFF]</p> <p>Load 2: H [ON], L [OFF]</p>	<p>* Voltage output (when the sensor is connected to a transistor circuit)</p>
EE-SPZ301	Dark-ON	<p>Incident: [ON]</p> <p>Interrupted: [OFF]</p> <p>Light indicator (red): ON [OFF], OFF [ON]</p> <p>Output transistor: ON [OFF], OFF [ON]</p> <p>Load 1 (relay): Operates [OFF], Releases [ON]</p> <p>Load 2: H [OFF], L [ON]</p>	

## Safety Precautions

Refer to *Warranty and Limitations of Liability*.

**⚠ WARNING**

**This product is not designed or rated for ensuring safety of persons. Do not use it for such purposes.**

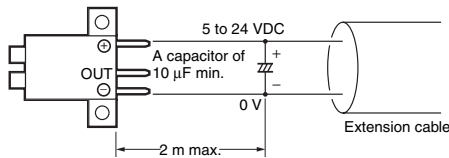


**Precautions for Correct Use**

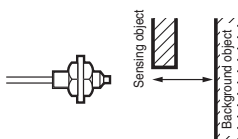
Make sure that this product is used within the rated ambient environment conditions.

**Wiring**

- A fiber that has been connected once cannot be disconnected.
- Use a cable with a wire size of at least AWG22 (cross-sectional area: 0.3 mm<sup>2</sup>). The total cable length must be of 2 m maximum.
- To use a cable length longer than 2 m, attach a capacitor with a capacitance of approximately 10 μF to the wires as shown below. The distance between the terminal and the capacitor must be within 2 m. (Use a capacitor with a dielectric strength that is at least twice the Sensor's power supply voltage.)



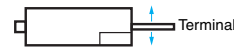
- The sensing distance of the EE-SPZ301/401 with the E32-DC200 are based on sensing a sheet of white paper with a reflection factor of 90%.
- When using the EE-SPZ301/401 with the E32-DC200 to detect a piece of white paper with a reflection factor of 90%, the sensing distance varies from 6 to 10 mm depending on the product.
- When using the EE-SPZ301/401 with the E32-DC200 to detect an object, the objects in the background should not be glossy.



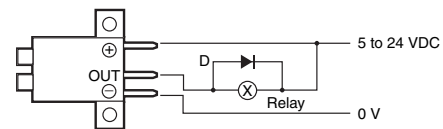
Decrease reflection from the background object, e.g., by providing a sufficient distance to the background or by using a black sponge or similar material as the background.

- Connection is made using a connector. Do not solder to the pins (leads). Use EE-1002 a connector or a EE-1003 (with a 1-m cable) connector. A EE-1003A Hold-down clip is available to prevent the EE-1003 connector from becoming disconnected.

- Make sure that the terminals are not subjected to stress (external force). Stress will cause damage to the terminals.

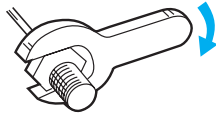


- If a metal mounting base causes inductive noise, the Photomicrosensor falsely detect incident light. If necessary, implement the following countermeasures.
  - (1) Connect the Sensor's negative terminal and mounting frame so that they have the same electric potential.
  - (2) Connect the Sensor's negative terminal and mounting frame through a 0.47-μF capacitor.
  - (3) Insert a 10-mm-thick plastic insulation plate between the Sensor and the mounting frame.
- When driving a small inductive load, such as a relay, wire as shown below. (Be sure to connect a diode to absorb the reverse voltage.)



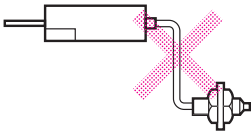
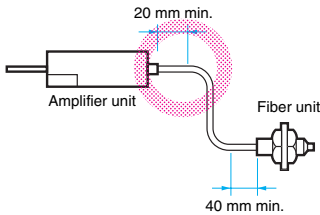
## Tightening the Fiber Unit

- Use a tightening force of 0.78 N·m max.
- Use a tool appropriate for the nut.

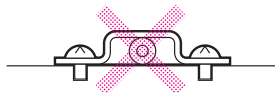
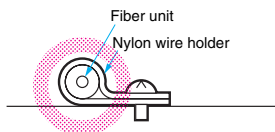


## Mounting the Fiber Unit

- Do not pull, press, or otherwise apply excessive force to the Fiber Unit.
- The bending radius of the Fiber Unit must be as large as possible (radius: 25 mm min.).
- As shown in the following figure, any bends must be made at least 40 mm from the base of the Unit.

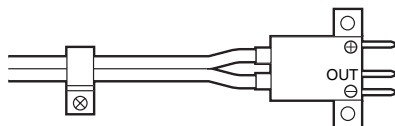


- Do not compress or apply a weight to the Fiber Unit.



## Installation

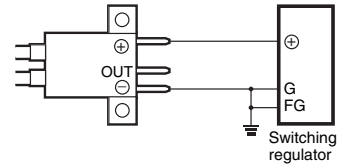
- When three or four Through-beam Sensors must be installed side-by-side, place the emitters and receivers on alternating sides.
- When using a Reflective Sensor to detect slow moving objects, incorrect operation may occur even if two Sensors are installed side-by-side.
- Be sure to keep the Amplifier Unit under 55°C even when using the fiber ends in high temperature environments.
- The connection force of the fiber and the Photomicrosensor will decrease when the ambient temperature is high. If high ambient temperatures can be expected, install the fiber with a holder or clip, and do not pull on the fiber.



Install the fiber with a holder or clip.

## Power Supply

- For increased operation stability, install a FG (frame ground terminal) or G (ground terminal) when using a commercially available switching regulator.

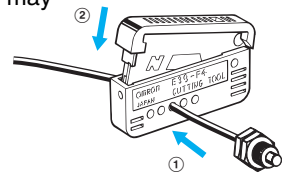


## Mounting the Fiber Unit

1. Set at Fiber Unit at the specified length and cut it with the Fiber Cutting Tool.

### Fiber Cutting Tool

- Insert the fiber into one of the insertion holes of the E39-F4 Cutting Tool to cut the fiber to the desired length.
- Press down the blade of the Cutting Tool to cut the fiber in a single stroke. Do not stop the Cutting Tool midway.
- Each insertion hole can be used only once. Do not use it again, otherwise the fiber may not be cut properly and the sensing distance may decrease.



2. Set the Fiber Unit in the EE-SPZ301/401.

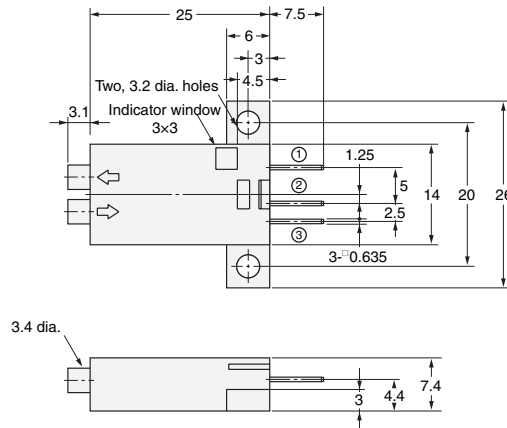
(Do not remove the Fiber Unit once it has been installed. Doing so may prevent the stopper in the Sensor from working properly, causing the Fiber Unit to become disconnected.)

## Dimensions

Unless otherwise specified, the tolerance class IT16 is used for dimensions in this data sheet.

### Sensors

EE-SPZ301  
EE-SPZ401

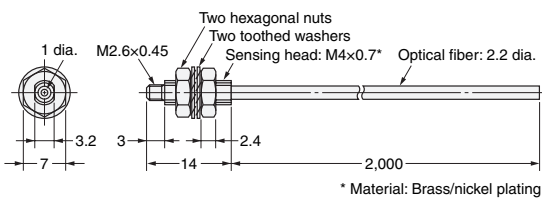


Terminal Arrangement

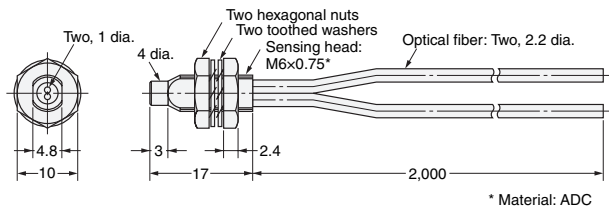
①	⊕	Vcc
②	OUT	OUTPUT
③	⊖	GND (0 V)

### Fiber Units

Standard Fiber, Through-beam  
E32-TC200

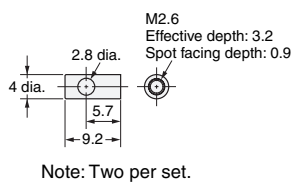


Standard Fiber, Reflective  
E32-DC200

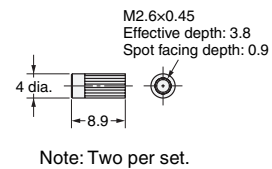


### Other Products

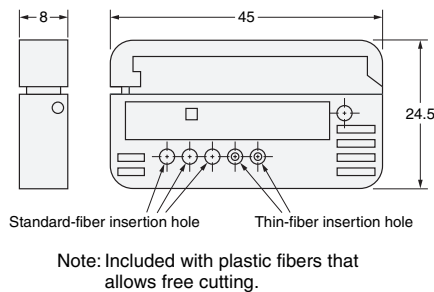
Lens Units  
E39-F1



Side-view Units  
E39-F2



Fiber Cutter  
E39-F4



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

## 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.

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- 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 PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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## Disclaimers

### 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 products 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.

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2008.9

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