Compact Photoelectric Sensor with Built-in Amplifier

E3ZG

CSM_E3ZG_DS_E_2_1

E3ZG series contributes to automation through its economic and excellent performance.

- Long sensing distance of 15 m for Through-beam Models, 4 m for Retro-reflective Models, and 1 m for Diffuse-reflective Models.
- Mechanical axis and optical axis offset of less than ±2.5° simplifies optical axis adjustment.
- High stability with unique algorithm that prevents interference of external light.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

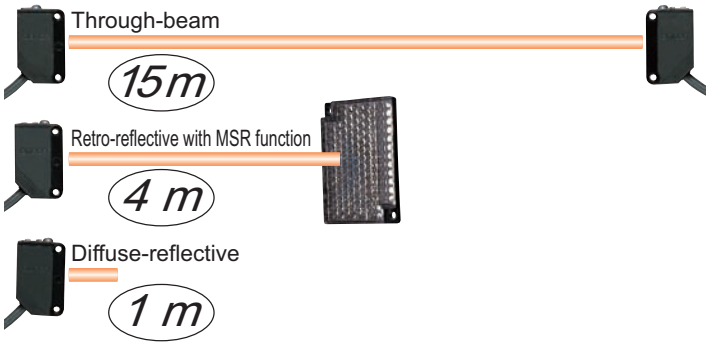
Be sure to read *Safety Precautions* on page 8.

Features

Industry's Top-level Sensing Distance with Built-in Amplifier

A separately sold filter is available to prevent mutual interference for Through-beam Models with red lights sources and a sensing distance of 10 m. Reflective Models include functionality to prevent mutual interference (up to 2 sensors).

Long-distance, Through-beam Sensors with a detection distance of 15 m (response time: 1 ms) are also available.

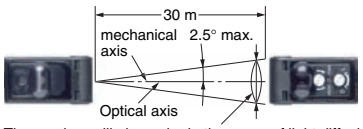


Low-temperature Operation for Applications in Cold-storage Warehouses

A wider ambient operating range from –40 to 55°C (main models with connectors). We also provide Sensor I/O Connectors with PUR Cables for high resistance to cold environments.

Improved Matching of Optical Axis and Mechanical Axis for Through-beam Models and Retro-reflective Models

The offset between the optical axis and the mechanical axis is kept within ±2.5°, so the optical axis can be accurately set simply by mounting the Sensor according to the mechanical axis.

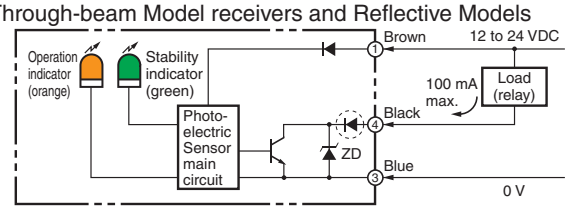


The receiver will always be in the range of light diffusion.

Sensor Protection against Incorrect Wiring

The Sensor includes output reverse polarity protection.
(A diode to protect against reverse polarity is added to the output line.)

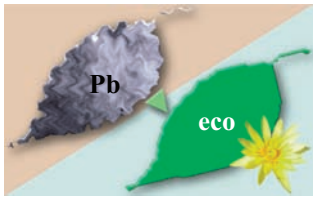
Through-beam Model receivers and Reflective Models



Protection for NPN output models

Complete Compliance with the EU's RoHS Directive

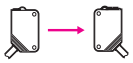
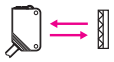
Lead, mercury, cadmium hexachrome, polybrominated biphenyl (PBB), and polybrominated diphenyl ether (PBDE) have all been eliminated. Also, burnable polyethylene packaging has been used.



Ordering Information

Sensors [Refer to *Dimensions on page 9.*]

Red light Infrared light

Sensing method	Appearance	Connection method	Sensing distance	Model	
				NPN output	PNP output
Through-beam (Emitter + Receiver)		Pre-wired (2 m)	15 m	E3ZG-T61-S 2M	E3ZG-T81-S 2M
		Standard M8 connector		E3ZG-T66-S	E3ZG-T86-S
		Pre-wired (2 m)	10 m	E3ZG-T61A-S 2M	E3ZG-T81A-S 2M
		Standard M8 connector		E3ZG-T66A-S	E3ZG-T86A-S
Retro-reflective with MSR function	 *1	Pre-wired (2 m)	4 m *2 (100 mm)	E3ZG-R61-S 2M	E3ZG-R81-S 2M
		Standard M8 connector		E3ZG-R66-S	E3ZG-R86-S
Diffuse-reflective		Pre-wired (2 m)	5 to 100 mm (wide view)	E3ZG-D61-S 2M	E3ZG-D81-S 2M
		Standard M8 connector		E3ZG-D66-S	E3ZG-D86-S
		Pre-wired (2 m)	1 m	E3ZG-D62-S 2M	E3ZG-D82-S 2M
		Standard M8 connector		E3ZG-D67-S	E3ZG-D87-S

*1. The Reflector is sold separately. Select the Reflector model most suited to the application.
*2. The sensing distance specified is possible when the E39-R1S is used. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

Accessories (Order Separately)

Slit (A Slit is not provided with Through-beam Sensors) Order a Slit separately if required. [Refer to *Dimensions* on page 11.]

Slit width	Sensing distance E3ZG-T□□-S (sensing distance of 15 m)	Minimum detectable object (Reference value)	Model	Contents
0.5-mm dia.	50 mm	0.2-mm dia.	E39-S65A	One set (contains Slits for both the Emitter and Receiver)
1-mm dia.	200 mm	0.4-mm dia.	E39-S65B	
2-mm dia.	800 mm	0.7-mm dia.	E39-S65C	
0.5 × 10 mm	1 m	0.2-mm dia.	E39-S65D	
1 × 10 mm	2.2 m	0.5-mm dia.	E39-S65E	
2 × 10 mm	5 m	0.8-mm dia.	E39-S65F	

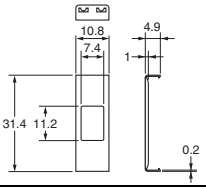
Reflectors (Reflector required for Retroreflective Sensors) A Reflector is not provided with the Sensor. Be sure to order a Reflector separately. [Refer to *Dimensions* on *E39-L/E39-S/E39-R*]

Name	Sensing distance * E3ZG-R□□-S		Model	Quantity	Remarks
	Rated value	Reference value			
Reflector	3 m (100 mm)	---	E39-R1	1	• Retro-reflective models are not provided with Reflectors. • The MSR function is enabled.
	4 m (100 mm)	---	E39-R1S	1	
	---	5 m (100 mm)	E39-R2	1	
	---	2.5 m (100 mm)	E39-R9	1	
	---	3.5 m (100 mm)	E39-R10	1	
Fog Preventive Coating	---	3 m (100 mm)	E39-R1K	1	
Small Reflector	---	1.5 m (50 mm)	E39-R3	1	
Tape Reflector	---	700 mm (150 mm)	E39-RS1	1	
	---	1.1 m (150 mm)	E39-RS2	1	
	---	1.4 m (150 mm)	E39-RS3	1	

Note: 1. If you use the Reflector at any distance other than the rated distance, make sure that the stability indicator lights properly when you install the Sensor.
2. For details, refer to *Reflectors* on the *E39-L/E39-S/E39-R* information available on the OMRON website.
* Values in parentheses indicates the minimum required distance between the Sensor and Reflector.

Mutual Interference Protection Filter

A Filter is not provided with the Sensor (for the through-beam E3ZG-T□□A-S). Order a Filter separately if required.

Sensing distance	Appearance/Dimensions	Model	Quantity	Remarks
3 m		E39-E11	Two sets each for the Emitter and Receiver (total of four pieces)	Can be used with the E3ZG-T□□A-S Through-beam models. The arrow indicates the direction of polarized light. Mutual interference can be prevented by altering the direction of polarized light from or to adjacent Emitters and Receivers.

Note: The polarization directions of the Filters are offset by 90° to prevent interference. When you install the Emitter and Receiver, install them at the same angle to maintain this offset.

Mounting Brackets A Mounting Bracket is not enclosed with the Sensor. Order a Mounting Bracket separately if required.

[Refer to *Dimensions* on *E39-L/E39-S/E39-R*]

Appearance	Model (material)	Quantity	Remarks	Appearance	Model (material)	Quantity	Remarks
	**E39-L153 (SUS304)** *1	1	Mounting Brackets		**E39-L98 (SUS304)** *2	1	Metal Protective Cover Bracket
	**E39-L104 (SUS304)** *1	1			**E39-L150 (SUS304)**	1	(Sensor adjuster)
	**E39-L43 (SUS304)** *2	1	Horizontal Mounting Brackets		**E39-L151 (SUS304)**	1	Easily mounted to the aluminum frame rails of conveyors and easily adjusted. For left to right adjustment
	**E39-L142 (SUS304)** *2	1	Horizontal Protective Cover Bracket				
	**E39-L44 (SUS304)**	1	Rear Mounting Bracket		**E39-L144 (SUS304)** *2	1	Compact Protective Cover Bracket

Note: 1. When using Through-beam models, order one bracket for the Receiver and one for the Emitter.
2. For details, refer to *Mounting Brackets* on the *E39-L/E39-S/E39-R* information available on the OMRON website.
*1. Cannot be used for Standard Connector models with mounting surface on the bottom.
*2. Cannot be used for Standard Connector models.

Sensor I/O Connectors (Sockets on One Cable End)

(Models for Connectors and Pre-wired Connectors: A Connector is not provided with the Sensor. Be sure to order a Connector separately.)

[Refer to *Dimensions* for *XS3*.]

Size	Cable	Appearance	Cable type		Model
M8	Standard	Straight *2 	2 m	4-wire	**XS3F-M421-402-A**
			5 m		**XS3F-M421-405-A**
		L-shaped *2 *3 	2 m		**XS3F-M422-402-A**
			5 m		**XS3F-M422-405-A**
	PUR (Polyurethane) cable *1	Straight *2 	2 m		**XS3F-M421-402-L**
			5 m		**XS3F-M421-405-L**
		L-shaped *2 *3 	2 m		**XS3F-M422-402-L**
			5 m		**XS3F-M422-405-L**
	Vibration-proof robot cable	Straight *2 	2 m		**XS3F-M421-402-R**
			5 m		**XS3F-M421-405-R**
		L-shaped *2 *3 	2 m		**XS3F-M422-402-R**
			5 m		**XS3F-M422-405-R**

Note: 1. When using Through-beam models, order one connector for the Receiver and one for the Emitter.
2. For details, refer to the *XS3* information available on the OMRON website.
*1. The Sensor can be used in low-temperature environments (–25°C to –40°C). Do not use the Sensor in locations that are subject to oil.
*2. The connector will not rotate after connecting.
*3. The cable is fixed at an angle of 180° from the sensor emitter/receiver surface.

Ratings and Specifications

Item		Sensing method	Through-beam		Retro-reflective with MSR function	Diffuse-reflective	
Model	NPN output	Pre-wired	E3ZG-T61-S	E3ZG-T61A-S	E3ZG-R61-S	E3ZG-D61-S	E3ZG-D62-S
		Connector (M8)	E3ZG-T66-S	E3ZG-T66A-S	E3ZG-R66-S	E3ZG-D66-S	E3ZG-D67-S
	PNP output	Pre-wired	E3ZG-T81-S	E3ZG-T81A-S	E3ZG-R81-S	E3ZG-D81-S	E3ZG-D82-S
		Connector (M8)	E3ZG-T86-S	E3ZG-T86A-S	E3ZG-R86-S	E3ZG-D86-S	E3ZG-D87-S
Sensing distance			15 m	10 m	4 m (100 mm) * (when using E39-R1S) 3 m (100 mm) * (when using E39-R1)	100 mm (white paper: 100 × 100 mm)	1 m (white paper: 300 × 300 mm)
Spot diameter (reference value)			---				
Standard sensing object			Opaque: 12-mm dia. min.		Opaque: 75-mm dia. min.	---	
Minimum detectable object (reference value)			---				
Differential travel			---			20% max. of setting distance	
Directional angle			Both emitter and receiver: 3 to 15°		2 to 10°	---	
Light source (wavelength)			Infrared LED (870 nm)	Red LED (660 nm)	Red LED (660 nm)	Infrared LED (870 nm)	
Current consumption			35 mA max. (Emitter: 15 mA max., Receiver: 20 mA max.)		30 mA max.		
Protection circuits			Reversed power supply polarity protection, Output short-circuit protection, and Reversed output polarity protection		Reversed power supply polarity protection, Output short-circuit protection, Mutual interference prevention, and Reversed output polarity protection		
Response time			Operate or reset: 1 ms max.				
Degree of protection			IEC, IP65				
Connection method			Pre-wired cable (standard length: 2 m and 0.5 m), Connector (M8)				
Weight (packedstate)	Pre-wired cable (2 m)		Approx. 120 g		Approx. 65 g		
	Connector		Approx. 30 g		Approx. 20 g		
Material	Case		PBT (polybutylene terephthalate)				
	Lens		Modified polyarylate		Methacrylic resin	Modified polyarylate	

* Values in parentheses indicate the minimum required distances between the Sensors and Reflectors.

Common

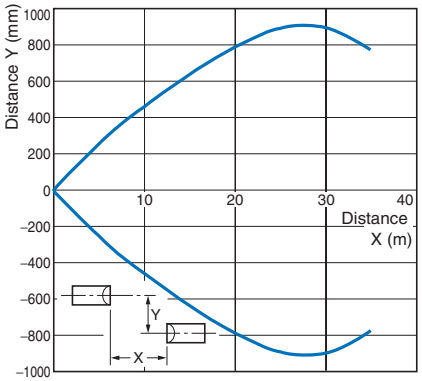
Power supply voltage	12 to 24 VDC±10%, ripple (p-p): 10% max.
Control output	Load power supply voltage: 26.4 VDC max., Load current: 100 mA max. Residual voltage: Load current of less than 10 mA: 1 V max. Load current of 10 to 100 mA: 2 V max. Open collector output (NPN/PNP depending on model) Light-ON/Dark-ON selectable
Sensitivity adjustment	One-turn adjuster
Ambient illumination (Receiver side)	Incandescent lamp: 3,000 lx max. Sunlight: 10,000 lx max.
Ambient temperature range	Operating: –25 to 55°C, Some connector models: –40°C to 55°C * (with no icing or condensation) Storage: –40 to 70°C (with no icing or condensation)
Ambient humidity range	Operating: 35% to 85%, Storage: 35% to 95% (with no condensation)
Insulation resistance	20 MΩ min. at 500 VDC
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min
Vibration resistance	Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions
Shock resistance	Destruction: 500 m/s^2 3 times each in X, Y, and Z directions
Indicator	Operation indicator (orange) Stability indicator (green) Through-beam Emitter has power indicator (orange) only.
Accessories	Instruction manual (Neither Reflectors nor Mounting Brackets are provided with any of the above models.)

* The ambient temperature range during operation for connector models depends on the model. For the E3ZG-T66-S/T86-S/R66-S/R86-S, the range is –40°C to 55°C. For the E3ZG-D66-S/D86-S/D67-S/D87-S, the range is –30°C to 55°C. For other connector models, the range is –25°C to –55°C.
The sensing distance for Retro-reflective Models (E3ZG-R66-S/R86-S) between –40°C to –25°C, however, will be as follows (not the values in the table):
With E39-R1S: 3 m (100 mm), With E39-R1: 2 m (100 mm).
Also, use the XS3F-M42□-4□□-L Sensor I/O Connector (PUR cable) for applications between –25°C to –40°C. (Refer to page 3.)

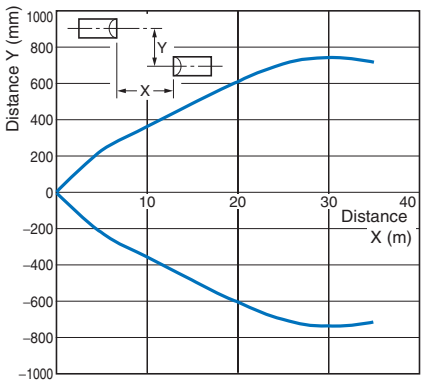
Engineering Data (Reference Value)

Parallel Operating Range

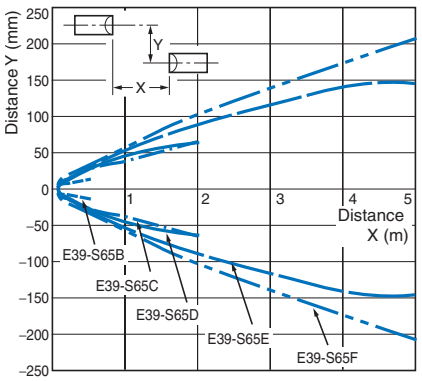
Through-beam Models
E3ZG-T□1(T□6)-S



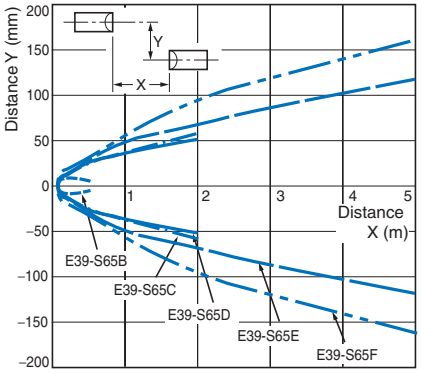
Through-beam Models
E3ZG-T□A-S



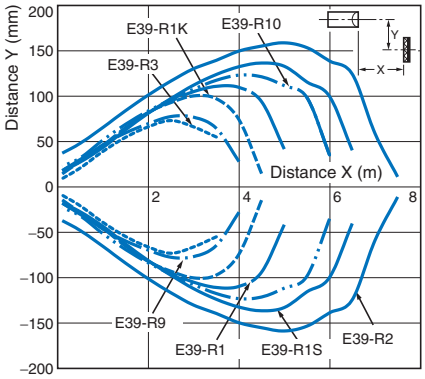
Through-beam Models
E3ZG-T□1(T□6)-S and Slit (A Slit is mounted to the Emitter and Receiver.)



Through-beam Models
E3ZG-T□A-S and Slit (A Slit is mounted to the Emitter and Receiver.)

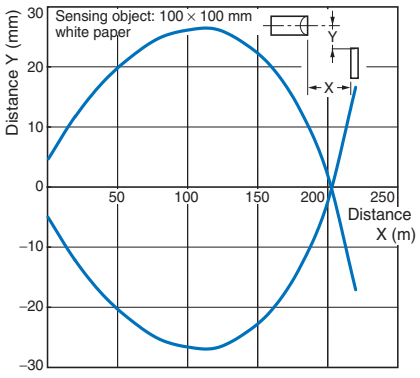


Retro-reflective Models
E3ZG-R□1(R□6)-S and Reflector

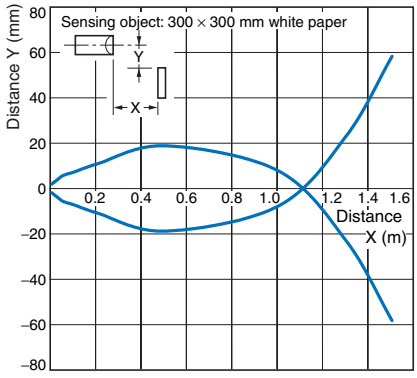


Operating Range

Diffuse-reflective Models
E3ZG-D□1(D□6)-S

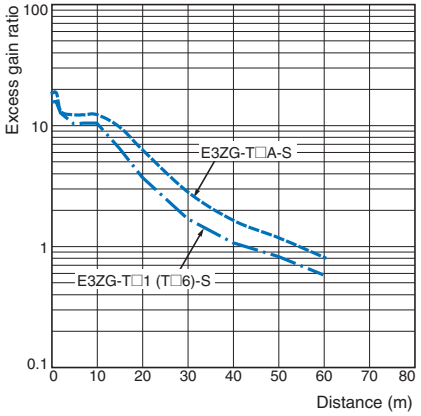


Diffuse-reflective Models
E3ZG-D□2(D□7)-S

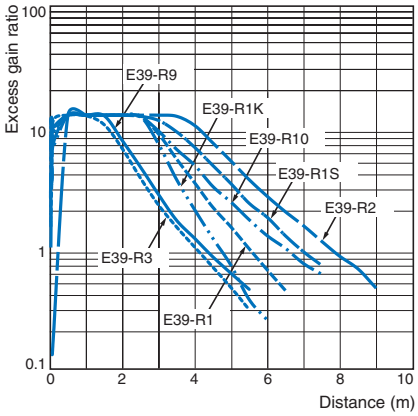


Excess Gain vs. Set Distance

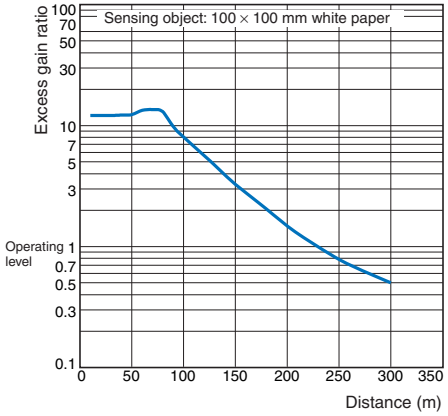
Through-beam Models
E3ZG-T□1(T□6)-S/-T□A-S



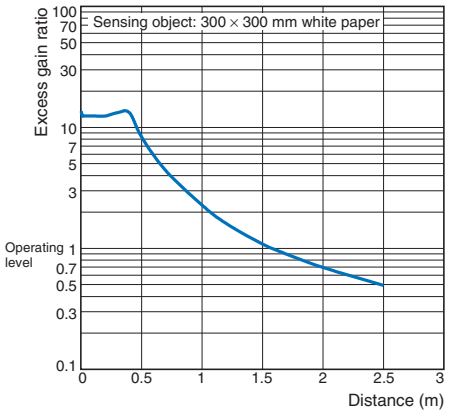
Retro-reflective Models
E3ZG-R□1(R□6)-S and Reflector



Diffuse-reflective Models
E3ZG-D□1(D□6)-S

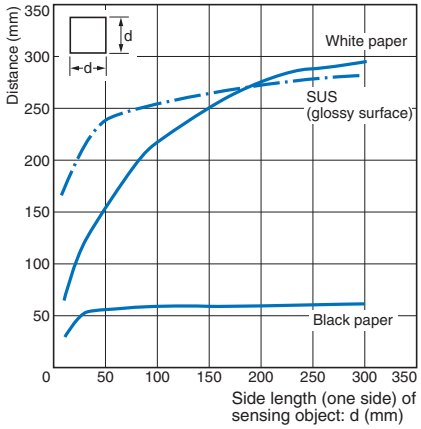


Diffuse-reflective Models
E3ZG-D□2(D□7)-S

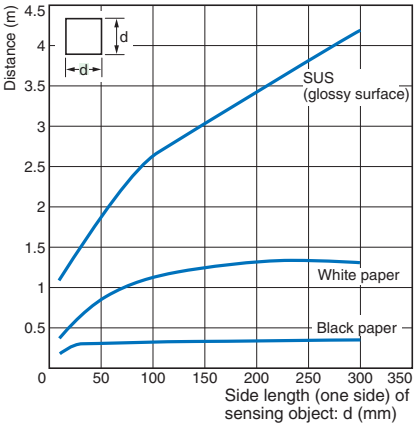


Sensing Object Size vs. Sensing Distance

Diffuse-reflective Models
E3ZG-D□1(D□6)-S

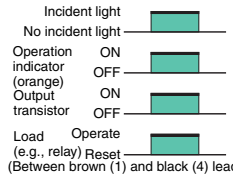
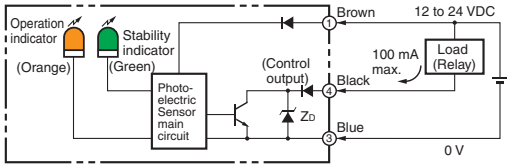
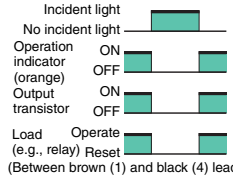
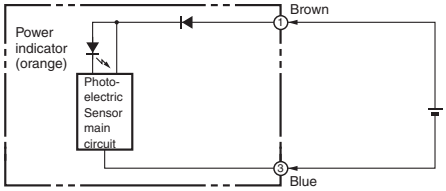


Diffuse-reflective Models
E3ZG-D□2(D□7)-S

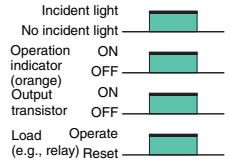
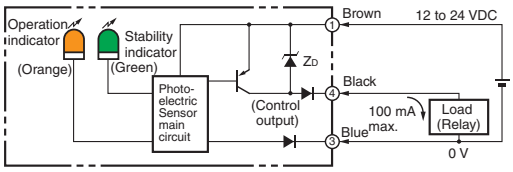
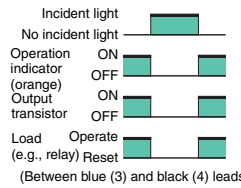
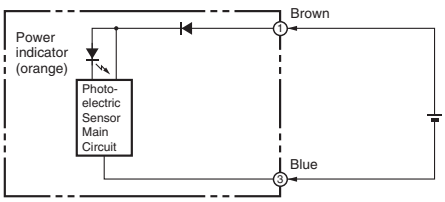


I/O Circuit Diagrams

NPN Output

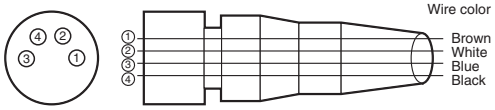
Model	Operation mode	Timing charts	Operation selector	Output circuit
E3ZG-T61-S E3ZG-T66-S E3ZG-T61A-S E3ZG-T66A-S E3ZG-R61-S E3ZG-R66-S E3ZG-D61-S E3ZG-D66-S E3ZG-D62-S E3ZG-D67-S	Light-ON		L side (LIGHT ON)	Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models, Limited reflective Models.  Connector Pin Arrangement  Pin 2 is not used.
	Dark-ON		D side (DARK ON)	
	Through-beam Emitter			Connector Pin Arrangement  Pins 2 and 4 are not used.

PNP Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3ZG-T81-S E3ZG-T86-S E3ZG-T81A-S E3ZG-T86A-S E3ZG-R81-S E3ZG-R86-S E3ZG-D81-S E3ZG-D86-S E3ZG-D82-S E3ZG-D87-S	Light-ON		L side (LIGHT ON)	Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models, Limited reflective Models.  Connector Pin Arrangement  Pin 2 is not used.
	Dark-ON		D side (DARK ON)	
	Through-beam Emitter			Connector Pin Arrangement  Pins 2 and 4 are not used.

Plugs (Sensor I/O Connectors)

M8 connector



XS3F-M421-402-A
XS3F-M421-405-A
XS3F-M422-402-A
XS3F-M422-405-A

Pin arrangement

Classification	Wire color	Connector pin No.	Application
DC	Brown	1	Power supply (+V)
	White	2	–
	Blue	3	Power supply (0 V)
	Black	4	Output

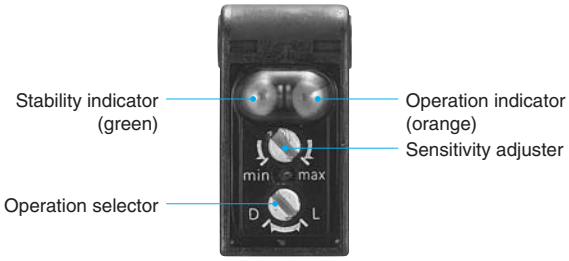
Note: Pin 2 is not used.

Nomenclature

Through-beam Models
E3ZG-T□□-S (Receiver)
E3ZG-T□□A-S (Receiver)

Retro-reflective Models
E3ZG-R□□-S

Diffuse-reflective Models
E3ZG-D□□-S



Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠WARNING

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

Precautions for Correct Use

Do not use the product in atmospheres or environments that exceed product ratings.

● Wiring

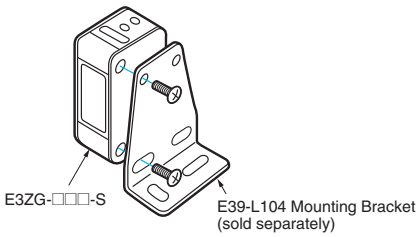
M8 Metal Connector

- Be sure to connect or disconnect the metal connector after turning OFF the Sensor.
- Hold the connector cover to connect or disconnect the metal connector.
- Secure the connector cover by hand. Do not use any pliers, otherwise the connector may be damaged.
- The proper tightening torque range is between 0.3 and 0.4 N·m. Be sure to tighten the connector securely, otherwise the specified degree of protection may not be maintained or the connector may be disconnected due to vibration.

● Mounting

Sensor Mounting

Use M3 screws to mount the sensor and tighten each screw to a maximum torque of 0.53 N·m.

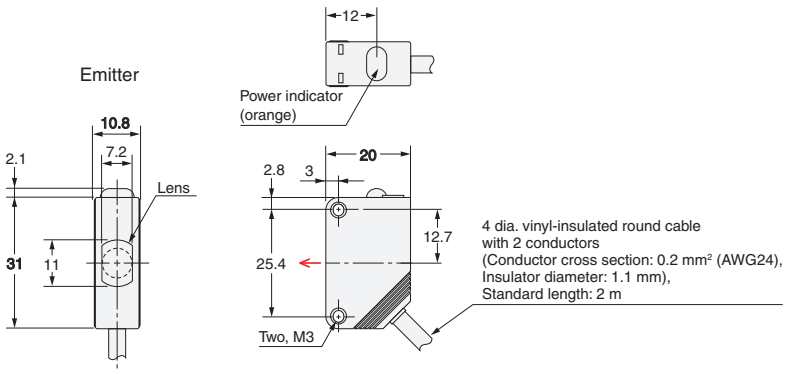


Dimensions

(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

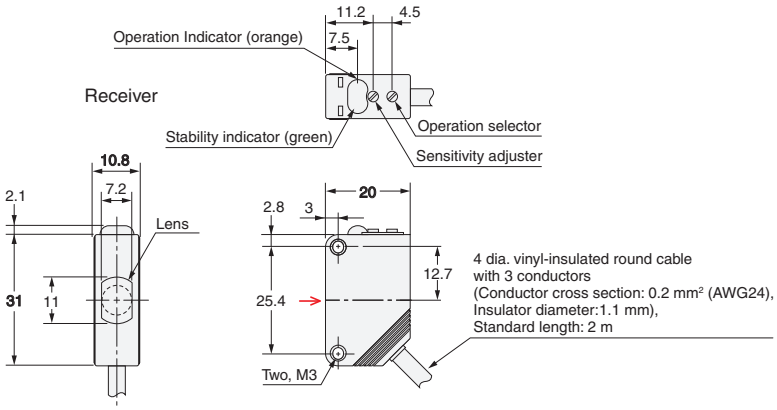
Sensors

Through-beam
Pre-wired Models
E3ZG-T61-S
E3ZG-T81-S
E3ZG-T61A-S
E3ZG-T81A-S



Terminal No.	Specifications
1	+V
2	—
3	0V
4	—

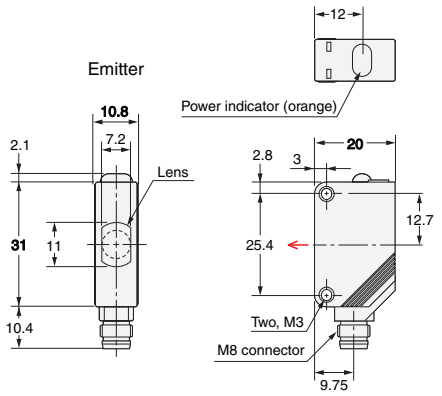
Pins 2 and 4 are not used.



Terminal No.	Specifications
1	+V
2	—
3	0V
4	Output

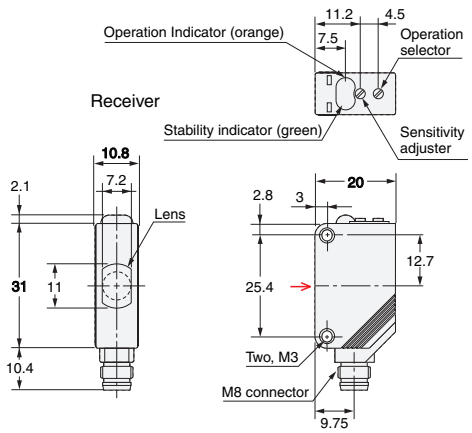
Pin 2 is not used.

Through-beam
Connector Models
E3ZG-T66-S
E3ZG-T86-S
E3ZG-T66A-S
E3ZG-T86A-S



Terminal No.	Specifications
1	+V
2	—
3	0V
4	—

Pins 2 and 4 are not used.



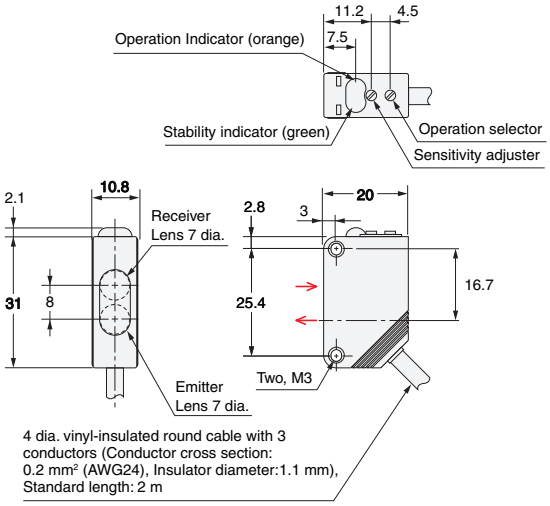
Terminal No.	Specifications
1	+V
2	—
3	0V
4	Output

Pin 2 is not used.

Retro-reflective Models

Pre-wired Models

E3ZG-R61-S
E3ZG-R81-S
E3ZG-D61-S
E3ZG-D81-S
E3ZG-D62-S
E3ZG-D82-S

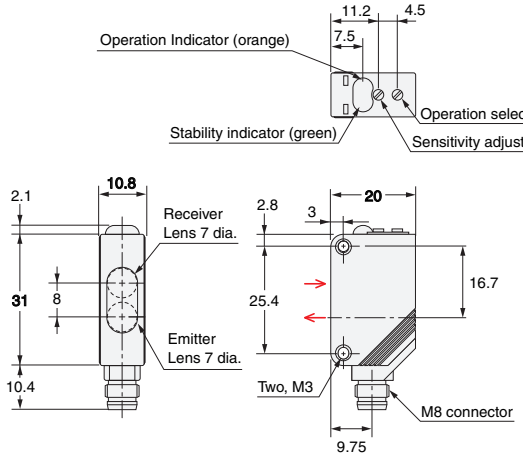


Terminal No.	Specifications
1	+V
2	---
3	0V
4	Output

Retro-reflective Models

Connector Models

E3ZG-R66-S
E3ZG-R86-S
E3ZG-D66-S
E3ZG-D86-S
E3ZG-D67-S
E3ZG-D87-S

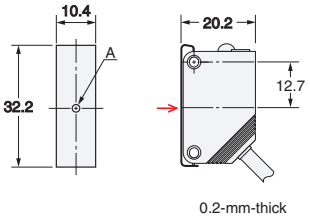


Terminal No.	Specifications
1	+V
2	---
3	0V
4	Output

Note: The lens for the E3ZG-D□1-S/D□6-S is red. The lens for the E3ZG-D□2-S/D□7-S is black.

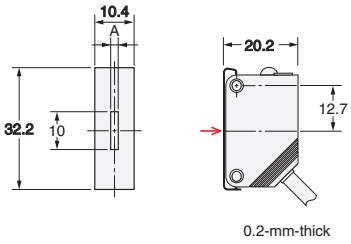
Accessories (Order Separately)

Slits
E39-S65A
E39-S65B
E39-S65C



Model	Size A	Material
E39-S65A	0.5 dia.	SUS301 stainless steel
E39-S65B	1.0 dia.	
E39-S65C	2.0 dia.	

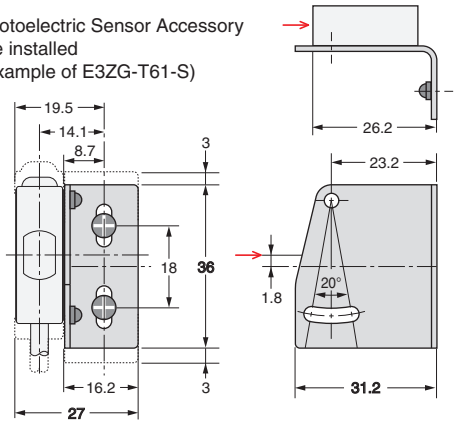
Slits
E39-S65D
E39-S65E
E39-S65F



Model	Size A	Material
E39-S65D	0.5	SUS301 stainless steel
E39-S65E	1.0	
E39-S65F	2.0	

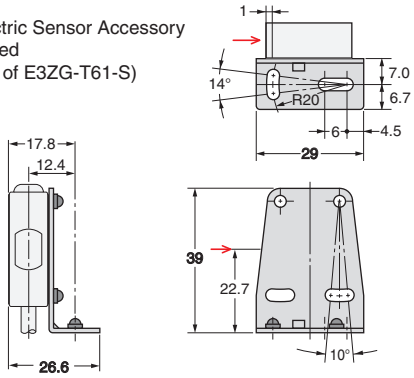
Slits
E39-L44

Photoelectric Sensor Accessory are installed
(Example of E3ZG-T61-S)



Slits
E39-L104

Photoelectric Sensor Accessory are installed
(Example of E3ZG-T61-S)



Mounting Brackets

Refer to *E39-R* for details.

Sensor I/O Connectors

Refer to *XS3□* for details.

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