


E3Z

The New Standard for Compact, Long-range Photoelectric Sensors Conserves Energy and Natural Resources, One Million Sold Yearly

- Long sensing distance of 15 m for Through-beam Models, 4 m for Retro-reflective Models, and 1 m for Diffuse-reflective Models.
- Unique algorithm minimizes external interference from inverter fluorescent lighting.
- Conserves energy and represents ongoing efforts aimed at eliminating materials containing lead.
- Provides a high degree of protection (IP67), mutual interference prevention, and EN standard compliance.
- Mechanical axis and optical axis offset always less than $\pm 2.5^\circ$ greatly simplifies optical axis alignment.







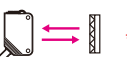




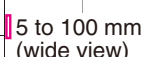








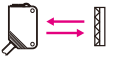
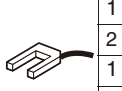
 Be sure to read *Safety Precautions* on page 9.

Ordering Information

Sensors

 Red light  Infrared light

Sensing method	Appearance	Connection method	Sensing distance	Model	
				NPN output	PNP output
Through-beam		Pre-wired (2 m) *3, *4		E3Z-T61 ^{*5} E3Z-T61 ^{*6}	E3Z-T81
		Connector (M8, 4 pins)		E3Z-T66	E3Z-T86
		Pre-wired (2 m) *3		E3Z-T61A ^{*5}	E3Z-T81A
		Connector (M8, 4 pins)		E3Z-T66A	E3Z-T86A
		Pre-wired (2 m) *3		E3Z-T62	E3Z-T82
		Connector (M8, 4 pins)		E3Z-T67	E3Z-T87
		Pre-wired (2 m) *3		E3Z-T62-G0	E3Z-T82-G0
		Connector (M8, 4 pins)		E3Z-T67-G0	E3Z-T87-G0
Oil-resistive Through-beam		Pre-wired (2 m)		E3Z-T61K	E3Z-T81K
		Pre-wired Connector (M8, 4 pins)		E3Z-T61K-M3J	E3Z-T81K-M3J
Retro-reflective with MSR function	 *1	Pre-wired (2 m) *3, *4		E3Z-R61 ^{*5} E3Z-R61 ^{*6}	E3Z-R81
	Connector (M8, 4 pins)	E3Z-R66		E3Z-R86	
Oil-resistive Retro-reflective with MSR function	 *1	Pre-wired (2 m)		E3Z-R61K	E3Z-R81K
		Pre-wired Connector (M8, 4 pins)		E3Z-R61K-M3J	E3Z-R81K-M3J
Diffuse-reflective		Pre-wired (2 m) *3, *4		E3Z-D61 ^{*5} E3Z-D61 ^{*6}	E3Z-D81
		Connector (M8, 4 pins)		E3Z-D66	E3Z-D86
		Pre-wired (2 m) *3, *4		E3Z-D62 ^{*5} E3Z-D62 ^{*6}	E3Z-D82
		Connector (M8, 4 pins)		E3Z-D67	E3Z-D87
Oil-resistive Diffuse-reflective		Pre-wired (2 m)		E3Z-D61K	E3Z-D81K
		Pre-wired Connector (M8, 4 pins)		E3Z-D61K-M3J	E3Z-D81K-M3J
		Pre-wired (2 m)		E3Z-D62K	E3Z-D82K
		Pre-wired Connector (M8, 4 pins)		E3Z-D62K-M3J	E3Z-D82K-M3J

Sensing method	Appearance	Connection method	Sensing distance	Model	
				NPN output	PNP output
Distance-settable		Pre-wired (2 m) *3	20 to 40 mm (BGS min setting) 20 to 200 mm (BGS max setting)	E3Z-LS61 *5	E3Z-LS81
		Standard M8 Connector	40 min. Incident threshold (FGS min setting) 200 min. Incident threshold (FGS max setting)	E3Z-LS66	E3Z-LS86
		Pre-wired (2 m) *3	2 to 20 mm (BGS min setting)	E3Z-LS63	E3Z-LS83
		Standard M8 Connector	2 to 80 mm (BGS max setting)	E3Z-LS68	E3Z-LS88
Narrow-beam Reflective		Pre-wired (2 m) *3	90±30 mm	E3Z-L61 *5	E3Z-L81
		Standard M8 Connector		E3Z-L66	E3Z-L86
Retro-reflective without MSR function for clear, plastic bottles		Pre-wired (2 m) *3	500 mm (80 mm) *2	E3Z-B61 *5	E3Z-B81
		Standard M8 Connector		E3Z-B66	E3Z-B86
		Pre-wired (2 m) *3	2 m (500 mm) *2	E3Z-B62 *5	E3Z-B82
		Standard M8 Connector		E3Z-B67	E3Z-B87
Slit-type Through-beam		1 axis	25 mm	E3Z-G61 *5	E3Z-G81
		2 axes		E3Z-G62 *5	E3Z-G82
		1 axis		E3Z-G61-M3J	E3Z-G81-M3J
		2 axes		E3Z-G62-M3J	E3Z-G82-M3J

Note: The sensing distance of Oil-resistive Retro-reflective models is different from that of standard Retro-reflective models.

*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 used. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

*3. Models with a 0.5-m cable are available as a standard feature for products marked *3. When ordering, specify the cable length by adding the code "0.5M" to the model number (e.g., E3Z-T61 0.5M).

*4. Pre-wired M12 Connectors are available for models in the table marked *4. These models have the -M1J suffix. (Example: E3Z-T61-M1J)

*5. Press-fit e-CON Pre-wired Connectors are available with 0.3-m, 0.5-m, and 2-m cables for models in the table marked *5.

The model number is E3Z-□□□-ECON. The connector is the E39-ECON□□M with a 2-m or 5-m cable and a connector on one end or the E39-ECONW□□M with a 0.5-m to 2-m cable (length increases in 0.1-m increments) and connectors at both ends.

This e-CON specification is rapidly becoming the standard for FA equipment and connector manufacturers.

*6. Clamp-type e-CON Pre-wired Connectors are available with a 2-m cable. The suffix for these models is -ECON-C. (Example: E3Z-T61-ECON-C 2 M) The connectors are E-39-ECON □□M with a 2-m or 5-m cable and a connector on one end or the E39-ECONW□□M with a 0.5-m to 2-m cable (length increases in 0.1-m increments) and connectors at both ends. This e-CON specification is rapidly becoming the standard for FA equipment and connector manufacturers.

Accessories (Order Separately)

Slit

Slit width	Sensing distance		Minimum detectable object (typical)	Model	Contents
	E3Z-T□□□	E3Z-T□□□A			
0.5 mm dia.	50 mm	35 mm	0.2 mm dia.	E39-S65A	One set (contains Slits for both the Emitter and Receiver)
1 mm dia.	200 mm	150 mm	0.4 mm dia.	E39-S65B	
2 mm dia.	800 mm	550 mm	0.7 mm dia.	E39-S65C	
0.5 × 10 mm	1 m	700 mm	0.2 mm dia.	E39-S65D	
1 × 10 mm	2.2 m	1.5 m	0.5 mm dia.	E39-S65E	
2 × 10 mm	5 m	3.5 m	0.8 mm dia.	E39-S65F	

Reflectors

Name	E3Z-R Sensing distance (typical)*	Model	Quantity	Remarks
Reflector	3 m (100 mm) (rated value)	E39-R1	1	<ul style="list-style-type: none"> Retro-reflective models are not provided with Reflectors. The MSR function is enabled.
	4 m (100 mm) (rated value)	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: The actual sensing distance may be reduced to approximately 70% of the typical sensing distance when using a Reflector other than E39-R1 or E39-R1S.

* Values in parentheses indicates the minimum required distance between the Sensor and Reflector.

Mutual Interference Protection Filter

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 E3Z-T□□A 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.

Mounting Brackets

Appearance	Model	Quantity	Remarks	Appearance	Model	Quantity	Remarks
	E39-L153	1	Mounting Brackets		E39-L98	1	Metal Protective Cover Bracket *
	E39-L104	1			E39-L150	1 set	(Sensor adjuster)
	E39-L43	1	Horizontal Mounting Brackets *		E39-L151	1 set	Easily mounted to the aluminum frame rails of conveyors and easily adjusted. For left to right adjustment
	E39-L142	1	Horizontal Protective Cover Bracket *				
	E39-L44	1	Rear Mounting Bracket		E39-L144	1	Compact Protective Cover Bracket (For E3Z only) *

Note: When using Through-beam models, order one bracket for the Receiver and one for the Emitter.
* Cannot be used for Standard Connector models.

Sensor I/O Connectors

Size	Cable	Appearance	Cable type	Model
M8 *	Standard	Straight	2 m	XS3F-M421-402-A
			5 m	XS3F-M421-405-A
		L-shaped	2 m	XS3F-M422-402-A
			5 m	XS3F-M422-405-A
M12 * (For -M1J models)	Standard	Straight	2 m	XS2F-D421-DC0-A
			5 m	XS2F-D421-GC0-A
		L-shaped	2 m	XS2F-D422-DC0-A
			5 m	XS2F-D422-GC0-A
e-CON	Standard	Single-end connector	2 m	E39-ECON2M
			5 m	E39-ECON5M
		Double-end connectors	0.5 to 1 m	E39-ECONW□M □ indicates cable length (in units of m). Specify with 0.1-increments.
			1.1 to 1.5 m	
			1.6 to 2 m	

Ratings and Specifications

Item	Sensing method		Through-beam			Retro-reflective with MSR function		Diffuse-reflective	
	Model	NPN output	E3Z-T61(K) E3Z-T66	E3Z-T62 E3Z-T67	E3Z-T61A E3Z-T66A	E3Z-R61/R66	E3Z-R61K	E3Z-D61(K)/D66	E3Z-D62(K)/D67
		PNP output	E3Z-T81(K) E3Z-T86	E3Z-T82 E3Z-T87	E3Z-T81A E3Z-T86A	E3Z-R81/R86	E3Z-R81K	E3Z-D81(K)/D86	E3Z-D82(K)/D87
Sensing distance		15 m	30 m	10 m	4 m (100 mm)* (when using E39-R1S) 3 m (100 mm)* (when using E39-R1)	3 m (150 mm)* (when using E39-R1S) 2 m (100 mm)* (when using E39-R1)	White paper (100 × 100 mm): 100 mm	White paper (300 × 300 mm): 1 m	
Spot diameter		---							
Standard sensing object		Opaque: 12-mm dia. min.			Opaque: 75-mm dia. min.		---		
Minimum detectable object		---							
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 (860 nm)		
Power supply voltage		12 to 24 VDC±10%, ripple (p-p): 10% max.							
Current consumption		35 mA max. (Emitter: 15 mA max., Receiver: 20 mA max.)			30 mA 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							
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.	Operate or reset: 2 ms max.	Operate or reset: 1 ms max.					
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, 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							
Degree of protection		IP67 (IEC 60529), Oil resistive models: IP67 (IEC 60529) (in-house standards: oilproof), excluding cables and connectors							
Connection method		Pre-wired cable (standard length: 2 m and 0.5m), Connector (M8, 4 pins), Pre-wired Connector (M8, 4 pins) (Oil-resistive models only)							
Indicator		Operation indicator (orange) Stability indicator (green) Emitter has power indicator (orange) only.							
Weight (packed state)	Pre-wired cable (2 m)	Approx. 120 g			Approx. 65 g				
	Connector (M8, 4 pins)	Approx. 30 g			Approx. 20 g				
	Pre-wired Connector (M8, 4 pins) (oil-re- sistive models only)	Approx. 50 g			Approx. 30 g				
Material	Case	PBT (polybutylene terephthalate)							
	Lens	Modified polyarylate			Methacrylic resin		Modified polyarylate		
Accessories		Instruction manual (Neither Reflectors nor Mounting Brackets are provided with any of the above models.)							

Note: Oil-resistive Retro-reflective models have a different sensing distance than standard Retro-reflective models.

* Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

The E3Z-T□2-G0 is equipped with an emission stop function. Ratings and specifications of this function are given in the following table.

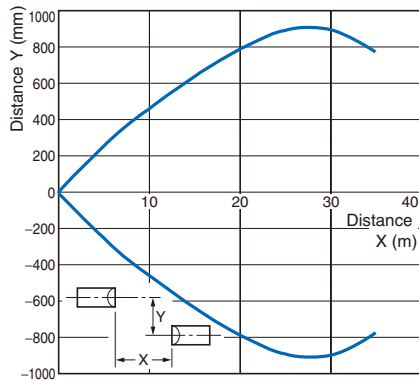
Item	Sensing method Output and Modes	Through-beam models, NPN output: E3Z-T62/T67-G0, PNP output: E3Z-T82/T87-G0
Emission stop function	Input	<NPN models> Emission OFF: Short-circuit to 0 V or 1.5 V max. (Outflow current 1 mA max.), Emission ON: Disconnected (Leakage current 0.1 mA max.) <PNP models> Emission OFF: Short-circuit to +DC (Power supply plus side) or +DC-1.5 V max. (Inlet current 3 mA max.), Emission ON: Disconnected (Leakage current 0.1 mA max.)
	Response time	Operate or reset: 0.5 ms max.

Engineering Data (Typical)

Parallel Operating Range

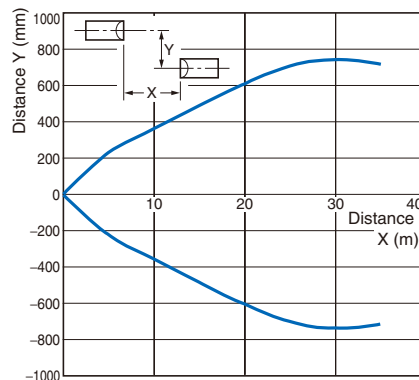
Through-beam Models

E3Z-T□1(T□6)



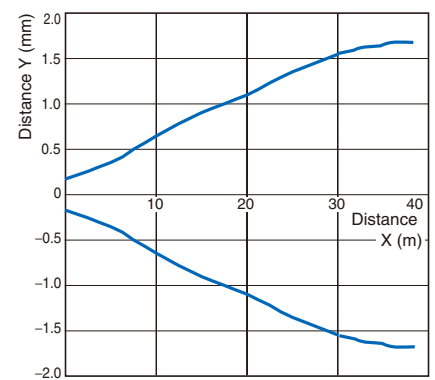
Through-beam Models

E3Z-T□A



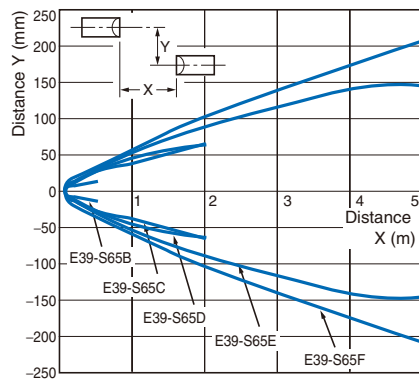
Through-beam Models

E3Z-T□2(T□7)



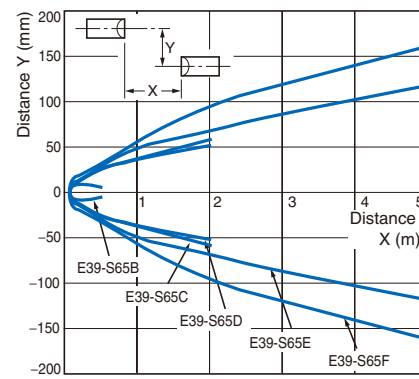
Through-beam Models

E3Z-T□1(T□6) and Slit



Through-beam Models

E3Z-T□A and Slit



Retro-reflective Models

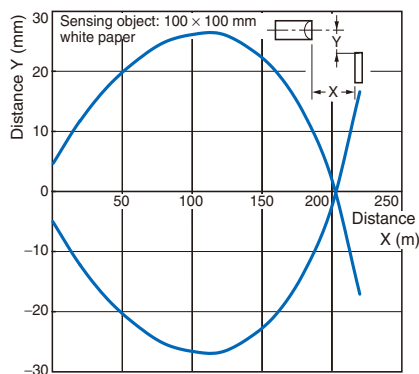
E3Z-R□1(R□6) and Reflector



Operating Range

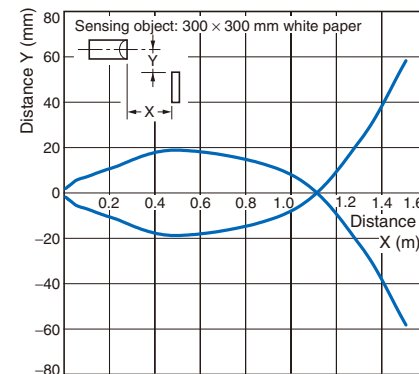
Diffuse-reflective Models

E3Z-D□1(D□6)



Diffuse-reflective Models

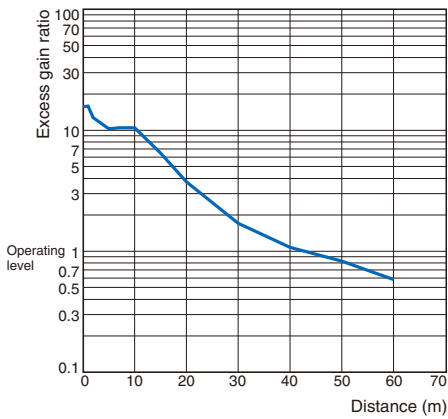
E3Z-D□2(D□7)



Excess Gain vs. Set Distance

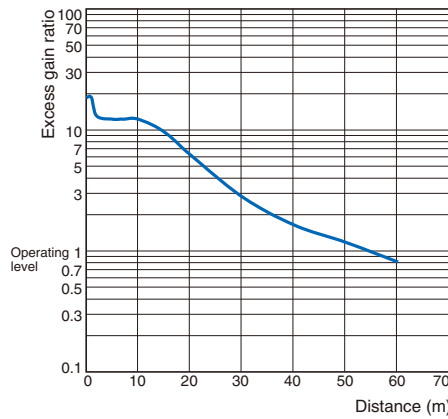
Through-beam Models

E3Z-T□1(T□6)



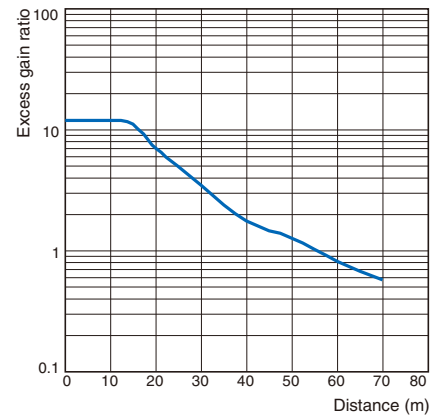
Through-beam Models

E3Z-T□A



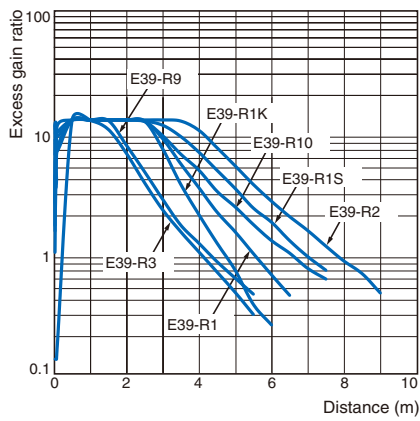
Through-beam Models

E3Z-T□2(T□7)



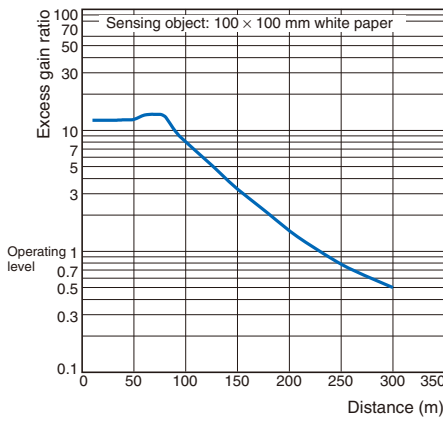
Retro-reflective Models

E3Z-R□1(R□6) and Reflector



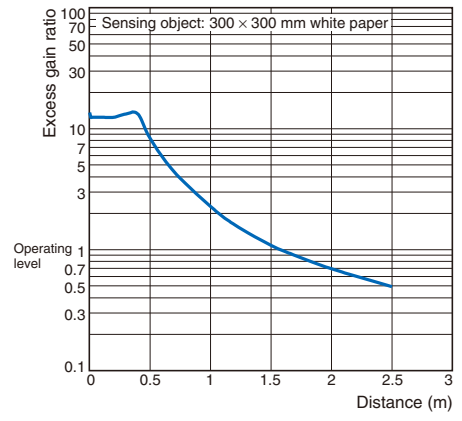
Diffuse-reflective Models

E3Z-D□1(D□6)



Diffuse-reflective Models

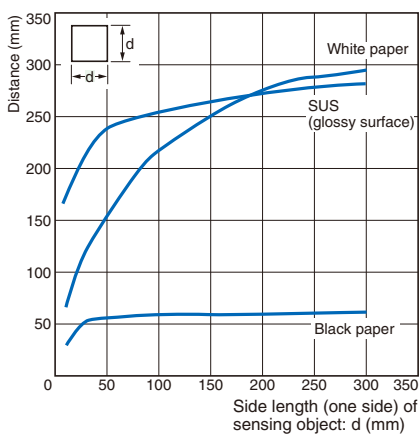
E3Z-D□2(D□7)



Sensing Object Size vs. Sensing Distance

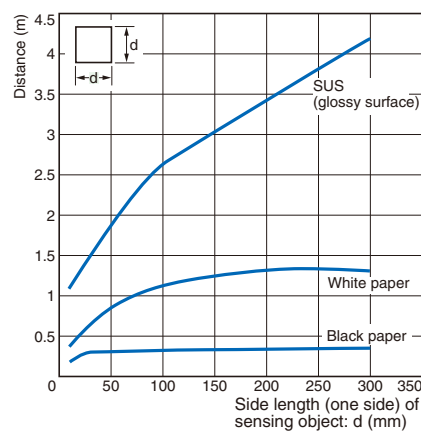
Diffuse-reflective Models

E3Z-D□1(D□6)



Diffuse-reflective Models

E3Z-D□2(D□7)



I/O Circuit Diagrams

NPN Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3Z-T61(K) E3Z-T66 E3Z-T61A E3Z-T66A E3Z-R61(K) E3Z-R66 E3Z-D61(K) E3Z-D66 E3Z-D62(K) E3Z-D67	Light-ON		L side (LIGHT ON)	<p>Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models.</p>
	Dark-ON		D side (DARK ON)	<p>Connector Pin Arrangement</p> <p>Pin 2 is not used.</p> <p>e-CON Connector Pin Arrangement</p>
	Through-beam Emitter		<p>Connector Pin Arrangement</p> <p>Pins 2 and 4 are not used.</p> <p>e-CON Connector Pin Arrangement</p>	
E3Z-T62-G0 E3Z-T67-G0	---		---	<p>Through-beam Emitter</p> <p>Connector Pin Arrangement</p> <p>Pin 4 is not used.</p>

PNP Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3Z-T81(K) E3Z-T86 E3Z-R81(K) E3Z-R86 E3Z-D81(K) E3Z-D86 E3Z-D82(K) E3Z-D87	Light-ON		L side (LIGHT ON)	<p>Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models</p>
	Dark-ON		D side (DARK ON)	<p>Connector Pin Arrangement</p> <p>Pin 2 is not used.</p>
	Through-beam Emitter		<p>Connector Pin Arrangement</p> <p>Pins 2 and 4 are not used.</p>	
E3Z-T82-G0 E3Z-T87-G0	---		---	<p>Through-beam Emitter</p> <p>Connector Pin Arrangement</p> <p>Pin 4 is not used.</p>

Plugs (Sensor I/O Connectors)

Wire color
Brown
White
Blue
Black

E39-ECON□M

E39-ECONW□M

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.

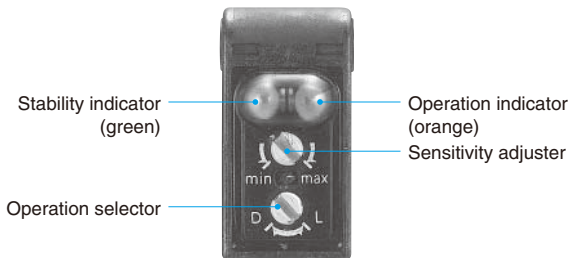
XS3F-M421-402-A
XS3F-M421-405-A
XS3F-M422-402-A
XS3F-M422-405-A

Nomenclature

Through-beam Models
E3Z-T□□ (Emitter)
E3Z-T□□A (Receiver)

Diffuse-reflective Models
E3Z-D□□

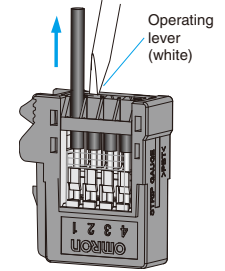
Retro-reflective Models
E3Z-R□□



Procedure for Adjusting Cable Length (Clamp-type e-CON Pre-wired Connector)

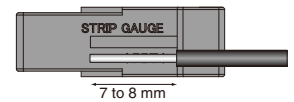
● Wire Removal Procedure

1. Use a flat-blade precision screwdriver to push the operating lever in and lock it in place. Pull out the wires.
2. Rewire immediately. If rewiring will not be performed for longer than 8 hours, be sure to release the operating lever. (See step 3 of the Wiring Procedure below.)



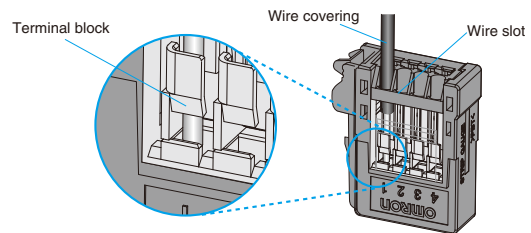
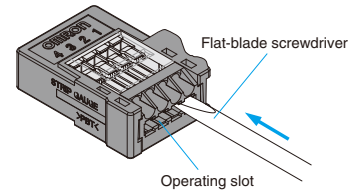
● Cable Length Adjustment Procedure

Cut the cable to the desired length. Place the cable wire on the strip gauge located on the side of the E3Z to determine the length of exposed wire. Strip 7 to 8 mm of the covering from the wire. If the cable is stranded, give the wire several twists.

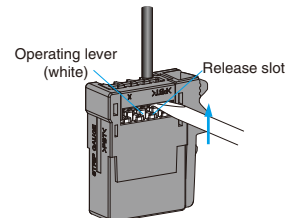


● Wiring Procedure

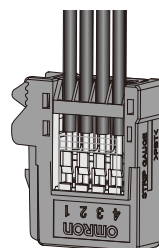
1. Use the flat-blade precision screwdriver to check and see if the lever is locked down in the operating slot.
2. Insert the wires into the wire slots as far as they will go. Make sure the tip of the conductors have passed all the way through the terminal block.



3. Insert the screwdriver into the release slot. Push up lightly until you hear the operating lever snap back into place.



4. Perform the following items.
 - Check to see if the operating lever is back in its initial position.
 - Repeat step 2 of the Wiring Procedure above. (The wiring is correct if there is resistance when each wire is lightly pulled.)



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

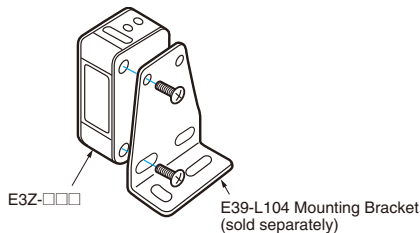
M8 Metal Connector

- 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.



● Oil-resistant Models

Oil Resistance

- Although the E3Z-□□□K Sensors have oil-resistant specifications, performance may be affected by certain types of oil. Refer to the following table.
- E3Z-□□□K Sensors are tested for resistance to the oils given in the following table. Refer to the information in the table when deciding which type of oil to use.

Test oil classification	Product name	Kinematic viscosity (mm ² /s) at 40°C	pH
Lubricant	Velocity No.3	2.02	---
Water insoluble machining oil	Yushiron Oil No.2 ac	Less than 10	
	Yushiroken EC50T-3		7 to 9.5
Water soluble machining oil	Yushiron Lubic HWC68	---	7 to 9.9
	Gryton 1700D		7 to 9.2
	Yushironken S50N		7 to 9.8

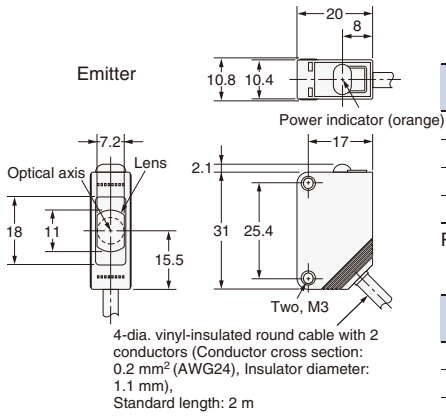
Note: 1. The E3Z maintained a minimum insulation resistance of 100 MΩ after it was dipped in all the above oils for 240 hours.

2. When using the Sensors in environments subject to oils other than those listed above, use the figures for kinematic viscosity and pH from the table as general guidelines. Additives and other substances contained in oils may affect the E3Z. Be sure to consider this before use.

Dimensions

Sensors

**Through-beam
Pre-wired Models**
E3Z-T61(K)
E3Z-T81(K)
E3Z-T61A
E3Z-T81A
E3Z-T62(-G0)
E3Z-T82(-G0)



4-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.2 mm² (AWG24), Insulator diameter: 1.1 mm), Standard length: 2 m

(Excluding -G0)

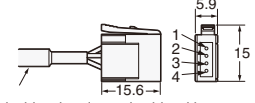
Terminal No.	Specifications
1	+V
2	--
3	0V
4	--

(-G0)

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

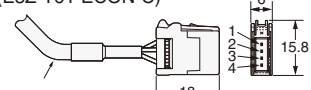
4 is not used.

Press-fit e-CON Pre-wired Connector



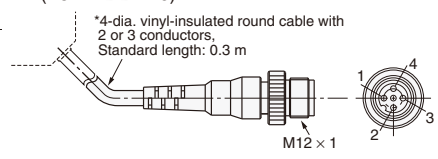
*4-dia. vinyl-insulated round cable with 2 or 3 conductors. Standard lengths: 0.3 m, 0.5 m, and 2 m

Clamp-type e-CON Pre-wired Connector (E3Z-T61-ECON-C)

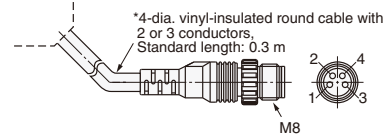


*4-dia. vinyl-insulated round cable with 2 or 3 conductors. Standard length: 2 m

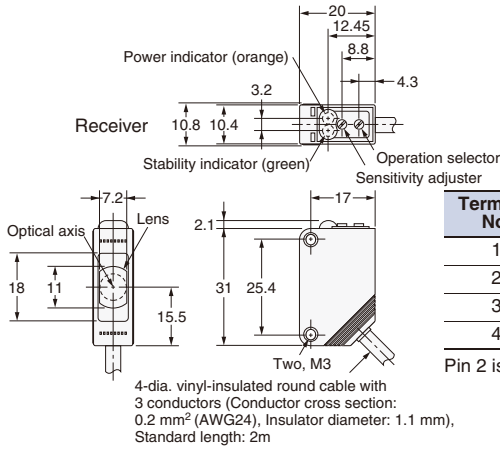
M12 Pre-wired Connector (E3Z-T□□-M1J)



M8 Pre-wired Connector (E3Z-T□□-M3J)



* The Emitter cable has two conductors and the Receiver cable has three conductors.

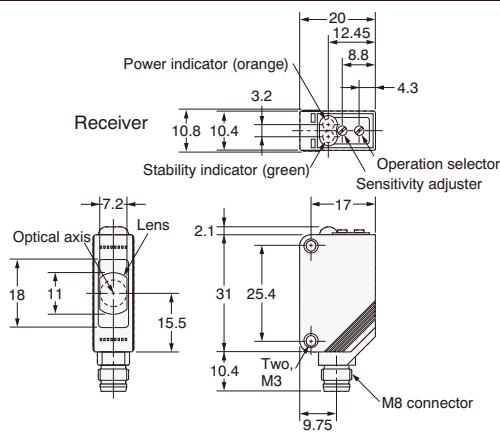
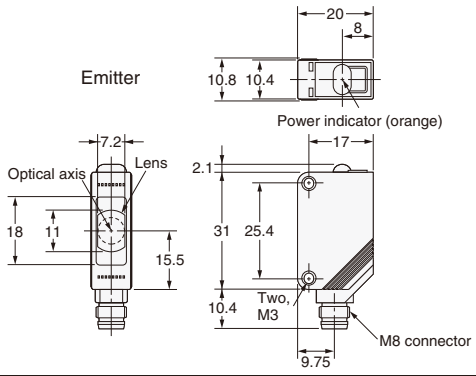


4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm² (AWG24), Insulator diameter: 1.1 mm), Standard length: 2m

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

Pin 2 is not used.

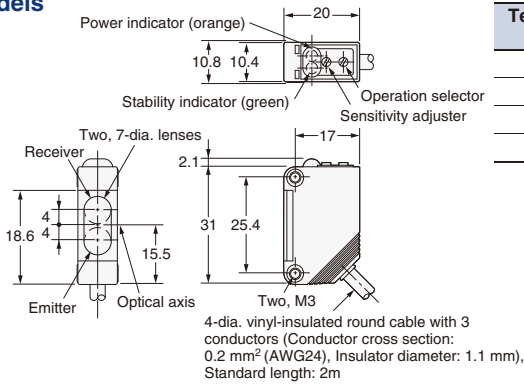
**Through-beam
Connector Models**
E3Z-T66
E3Z-T86
E3Z-T66A
E3Z-T86A
E3Z-T67(-G0)
E3Z-T87(-G0)



Retro-reflective Models

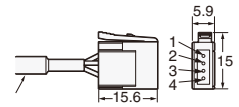
Pre-wired Models

E3Z-R61(K)
E3Z-R81(K)



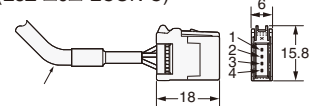
Terminal No.	Specifications
1	+V
2	---
3	0V
4	Output

Press-fit e-CON Pre-wired Connector



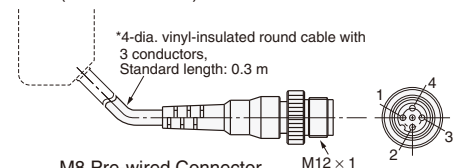
*4-dia. vinyl-insulated round cable with 3 conductors, Standard lengths: 0.3 m, 0.5 m, and 2 m

Clamp-type e-CON Pre-wired Connector (E3Z-□6□-ECON-C)

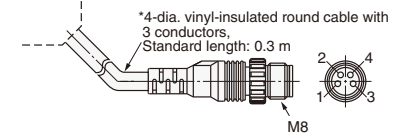


*4-dia. vinyl-insulated round cable with 3 conductors, Standard length: 2 m

M12 Pre-wired Connector (E3Z-□□□-M1J)

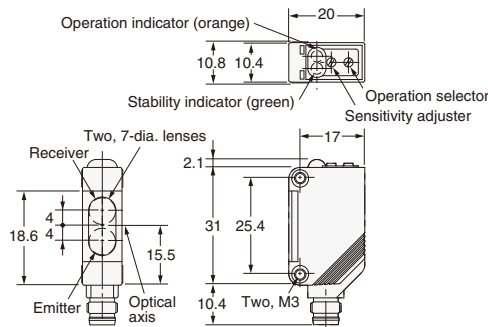


M8 Pre-wired Connector (E3Z-T□□K-M3J)



Connector Models

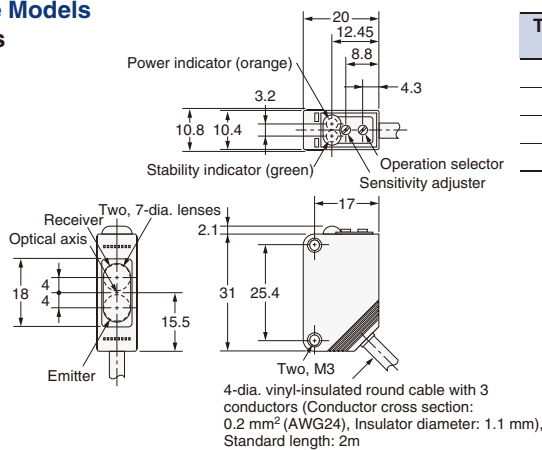
E3Z-R66
E3Z-R86



Diffuse-reflective Models

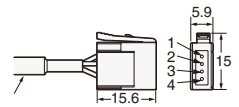
Pre-wired Models

E3Z-D61(K)
E3Z-D81(K)
E3Z-D62(K)
E3Z-D82(K)



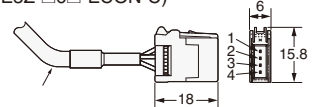
Terminal No.	Specifications
1	+V
2	---
3	0V
4	Output

Press-fit e-CON Pre-wired Connector



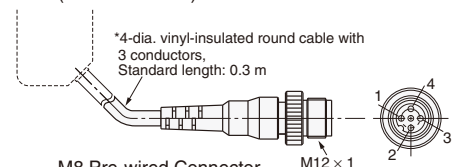
*4-dia. vinyl-insulated round cable with 3 conductors, Standard lengths: 0.3 m, 0.5 m, and 2 m

Clamp-type e-CON Pre-wired Connector (E3Z-□6□-ECON-C)

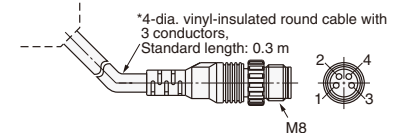


*4-dia. vinyl-insulated round cable with 3 conductors, Standard length: 2 m

M12 Pre-wired Connector (E3Z-□□□-M1J)

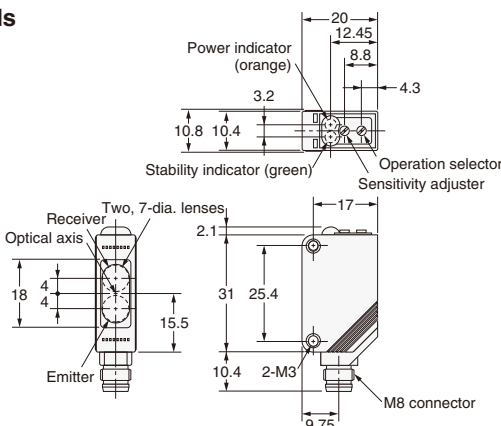


M8 Pre-wired Connector (E3Z-T□□K-M3J)



Connector Models

E3Z-D66
E3Z-D86
E3Z-D67
E3Z-D87



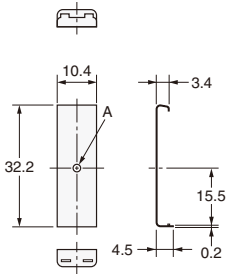
e-CON Connector Configurations

Wiring method	Sensor connectors
Press-fit	37104-3122-000FL (made by Sumitomo 3M)
Clamp	XN2A-1430 (made by OMRON)

Accessories (Order Separately)

Slits

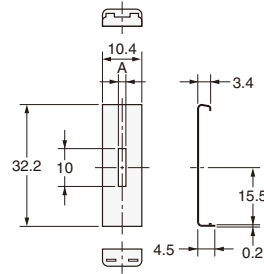
E39-S65A
E39-S65B
E39-S65C



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

Slits

E39-S65D
E39-S65E
E39-S65F



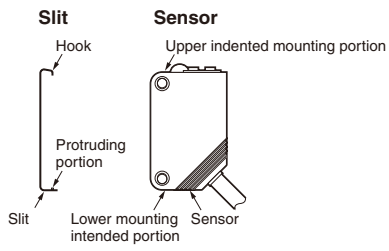
Model	Size A	Material
E39-S65D	0.5	SUS301 stainless steel
E39-S65E	1.0	SUS301 stainless steel
E39-S65F	2.0	SUS301 stainless steel

Reflectors

Mounting Brackets

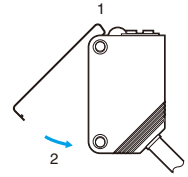
E3Z

Slits for Through-beam Models (E39-S65A/B/C/D/E/F (Sold Separately))

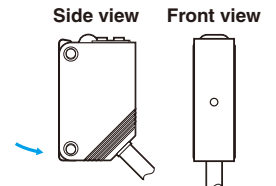


Mounting method

1. Hook the upper protruding portion of the Slit to the upper indented mounting portion of the Sensor and adjust the position of the Slit so that the Slit will be in parallel to the lens side of the Sensor.
2. Press the lower protruding portion of the Slit onto the indented mounting portion of the Sensor until the Slit snaps in.

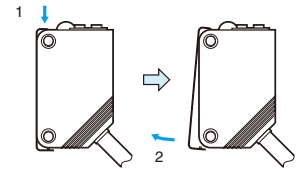


Mounting condition



Removal method

1. Press the upper portion of the Slit.
2. Disconnect the lower protruding portion of the Slit from the Sensor and remove the Slit.



Photoelectric Sensors Technical Guide

General Precautions

For precautions on individual products, refer to *Safety Precautions* in individual product information.

⚠ WARNING

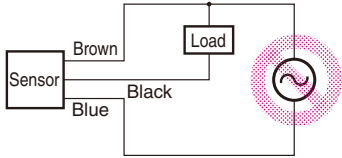
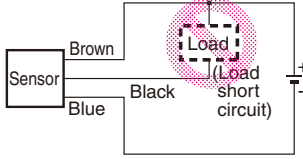
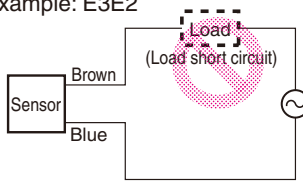
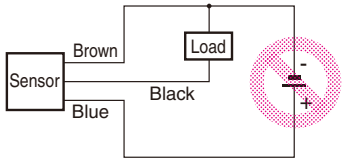
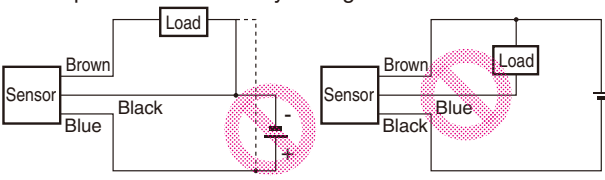
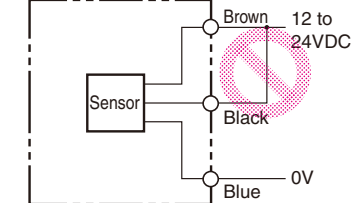
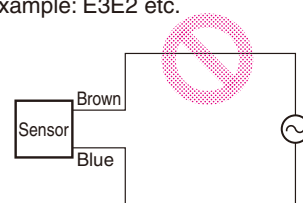
These Sensors cannot be used in safety devices for presses or other safety devices used to protect human life. These Sensors are designed for use in applications for sensing workpieces and workers that do not affect safety.



Precautions for Safe Use

To ensure safety, always observe the following precautions.

● Wiring

Item	Typical examples	
<p>Power Supply Voltage Do not use a voltage in excess of the operating voltage range. Applying a voltage in excess of the operating voltage range, or applying AC power (100 VAC or greater) to a DC Sensor may cause explosion or burning.</p>	<p>• DC Three-wire NPN Output Sensors</p> 	<p>---</p>
<p>Load Short-circuiting Do not short-circuit the load. Doing so may cause explosion or burning.</p>	<p>• DC Three-wire NPN Output Sensor</p> 	<p>• AC Two-wire Sensors Example: E3E2</p> 
<p>Incorrect Wiring Do not reverse the power supply polarity or otherwise wire incorrectly. Doing so may cause explosion or burning.</p>	<p>• DC Three-wire NPN Output Sensors Example: Incorrect Polarity</p> 	<p>• DC Three-wire NPN Output Sensors Example: Incorrect Polarity Wiring</p> 
<p>Connection without a load If the power supply is connected directly without a load, the internal elements may burst or burn. Be sure to insert a load when connecting the power supply.</p>	<p>• DC Three-wire NPN Output Sensors</p> 	<p>• AC 2-wire Sensors Example: E3E2 etc.</p> 

● Operating Environment

- (1) Do not use a Sensor in an environment where there are explosive or inflammable gases.
- (2) Do not use the Sensor in environments where the cables may become immersed in oil or other liquids or where liquids may penetrate the Sensor. Doing so may result in damage from burning and fire, particularly if the liquid is flammable.

Precautions for Correct Use

● Design

Power Reset Time

The Sensor will be ready to detect within approximately 100 ms after the power is turned ON.

If the Sensor and the load are connected to separate power supplies, turn ON the Sensor power before turning ON the load power. Any exceptions to this rule are indicated in *Safety Precautions* in individual product information.

Turning OFF Power

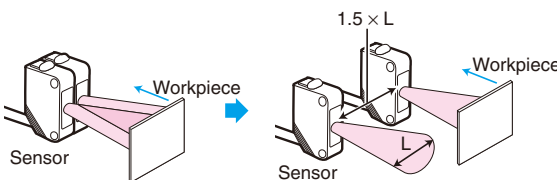
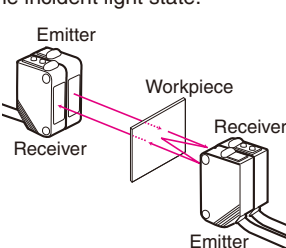
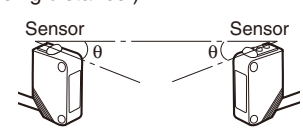
An output pulse may be generated when the power is turned OFF. It is recommended that the load or load line power be turned OFF before the Sensor power is turned OFF.

Power Supply Types

An unsmoothed full-wave or half-wave rectifying power supply cannot be used.

Mutual Interference

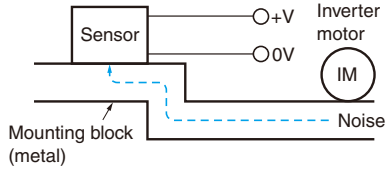
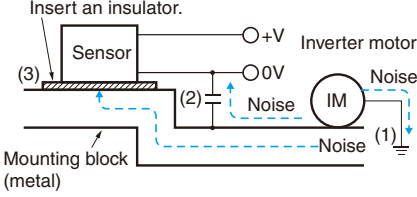

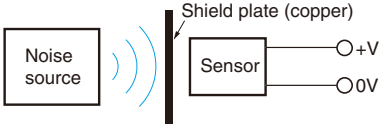
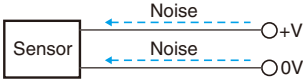
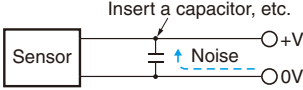
Mutual interference is a state where an output is unstable because the Sensors are affected by light from the adjacent Sensors. The following measures can be taken to avoid mutual interference.

Counter-measure	Concept	Through-beam Sensors	Reflective Sensors
1	Use a Sensor with the interference prevention function.	If Sensors are mounted in close proximity, use Sensors with the interference prevention function. 10 or fewer Sensors: E3X-DA□-S, E3X-MDA, E3C-LDA Fiber Sensors Performance, however, will depend on conditions. Refer to pages E3X-DA-S/E3X-MDA and E3C-LDA. 5 or fewer Sensors: E3X-NA Fiber Sensors 2 or fewer Sensors: E3T, E3Z, E3ZM, E3ZM-C, E3S-C, E3G-L1/L3, or E3S-C Built-in Amplifier Photoelectric Sensors (except Through-beam Sensors) E3C Photoelectric Sensor with separate amplifier	
2	Install an inference prevention filter.	A mutual interference prevention polarizing filter can be installed on only the E3Z-TA to allow close-proximity mounting of up to 2 Sensors. Mutual Interference Prevention Polarizing Filter: E39-E11	---
3	Separate Sensors to distance where interference does not occur.	Check the parallel movement distance range in the catalog, verify the set distance between adjacent Sensors, and install the Sensors accordingly at a distance at least 1.5 times the parallel movement distance range.	If the workpieces move from far to near, chattering may occur in the vicinity of the operating point. For this type of application, separate the Sensors by at least 1.5 times the operating range. 
4	Alternate Emitters and Receivers.	Close mounting of Sensors is possible by alternating the Emitters with the Receivers in a zigzag fashion (up to two Sensors). However, if the workpieces are close to the Photoelectric Sensors, light from the adjacent Emitter may be received and cause the Sensor to change to the incident light state. 	---
5	Offset the optical axes.	If there is a possibility that light from another Sensor may enter the Receiver, change the position of the Emitter and Receiver, place a light barrier between the Sensors, or take other measures to prevent the light from entering the Receiver. (Light may enter even if the Sensors are separated by more than the sensing distance.)	If Sensors are mounted in opposite each other, slant the Sensors as shown in the following diagram. (This is because the Sensors may affect each other and cause output chattering even if separated by more than the Sensor sensing distance.) 
6	Adjust the sensitivity.	Lowering the sensitivity will generally help.	

Photoelectric Sensors Technical Guide

Noise

Countermeasures for noise depend on the path of noise entry, frequency components, and wave heights. Typical measures are as given in the following table.

Type of noise	Noise intrusion path and countermeasure	
	Before countermeasure	After countermeasure
Common mode noise (inverter noise) (Common noise applied between the mounting board and the +V and 0-V lines, respectively.)	Noise enters from the noise source through the frame (metal). 	<ol style="list-style-type: none"> Ground the inverter motor (to 100 Ω or less) Ground the noise source and the power supply (0-V side) through a capacitor (film capacitor, 0.22 μF, 630 V). Insert an insulator (plastic, rubber, etc.) between the Sensor and the mounting plate (metal). 
Radiant noise (Ingress of high-frequency electromagnetic waves directly into Sensor, from power line, etc.)	Noise propagates through the air from the noise source and directly enters the Sensor. 	<ul style="list-style-type: none"> Insert a shield (copper) plate between the Sensor and the noise source e.g., a switching power supply). Separate the noise source and the Sensor to a distance where noise does not affect operation. 
Power line noise (Ingress of electromagnetic induction from high-voltage wires and switching noise from the switching power supply)	Noise enters from the power line. 	<ul style="list-style-type: none"> Insert a capacitor (e.g., a film capacitor), noise filter (e.g., ferrite core or insulated transformer), or varistor in the power line. 

● Wiring

Cable

Unless otherwise indicated, the maximum length of cable extension is 100 m using wire that is 0.3 mm² or greater.

Exceptions are indicated in **Safety Precautions** in individual product information.

Cable Tensile Strength

When wiring the cable, do not subject the cable to a tension greater than that indicated in the following table.

Cable diameter	Tensile strength
Less than 4 mm	30 N max.
4 mm or greater	50 N max.

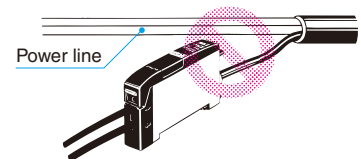
Note: Do not subject a shielded cable or coaxial cable to tension.

Repeated Bending

Normally, the Sensor cable should not be bent repeatedly. (For bending-resistant cable, see **Attachment to Moving Parts** on page C-4.)

Separation from High Voltage (Wiring Method)

Do not lay the cables for the Sensor together with high-voltage lines or power lines. Placing them in the same conduit or duct may cause damage or malfunction due to induction interference. As a general rule, wire the Sensor in a separate system, use an independent metal conduit, or use shielded cable.



Work Required for Unconnected Leads

Unused leads for self-diagnosis outputs or other special functions should be cut and wrapped with insulating tape to prevent contact with other terminals.

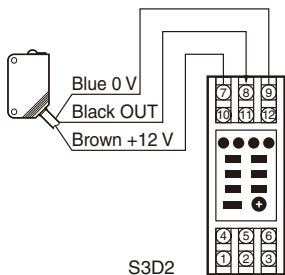
Power Supply

When using a commercially available switching regulator, ground the FG (frame ground) and G (ground) terminals. If not grounded, switching noise in the power supply may cause malfunction.

Example of Connection with S3D2 Sensor Controller

DC Three-wire NPN Output Sensors

Reverse operation is possible using the signal input switch on the S3D2.



● Mounting

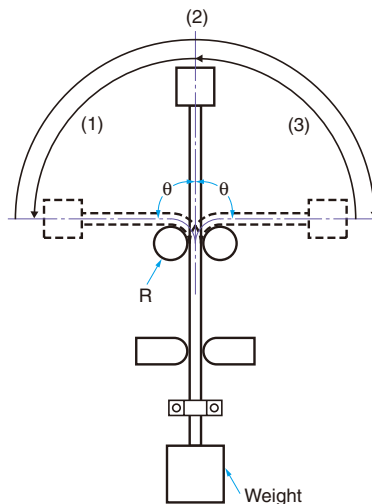
Attachment to Moving Parts

To mount the Photoelectric Sensor to a moving part, such as a robot hand, consider using a Sensors that uses a bending-resistant cable (robot cable).

Although the bending repetition tolerance of a standard cable is approximately 13,000 times, robot cable has an excellent bending tolerance of approximately 500,000 times.

Cable Bending Destruction Test (Tough Wire Breaking Test)

With current flowing, bending is repeated to check the number of bends until the current stops.



Specimen		Standard cable VR (H) 3 x18/0.12	Robot cable: Strong, conductive electrical wire 2 x 0.15 mm ² , shielded
Description/conditions	Bending angle (θ)	Left/right 90° each	Left/right 45° each
	Bending repetitions	---	60 bends/minute
	Weight	300g	200g
	Operation per bending	(1) through (3) in figure once	(1) through (3) in figure once
	Bending radius of support points (R)	5 mm	2.5 mm
Result		Approx. 13,000 times	Approx. 500,000 times

The testing conditions of the standard cable and robot cable are different.

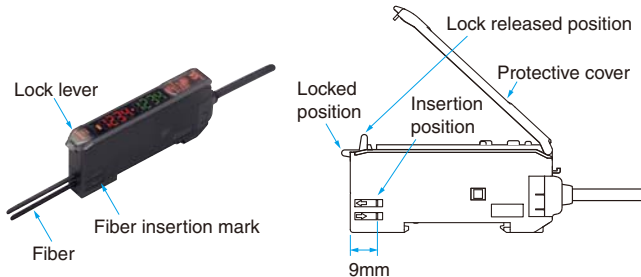
Refer to the values in the above table to check bend-resistant performance under actual working conditions.

Securing Fibers

The E3X Fiber Unit uses a one-touch locking mechanism. Use the following methods to attach and remove Fiber Units.

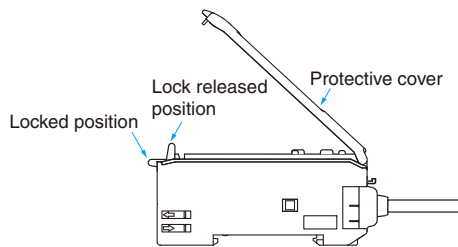
(1) Attaching Fibers

Open the protective cover, insert the fiber up to the insertion mark on the side of the Fiber Unit, and then lower the lock lever.



(2) Removing Fibers

Open the protective cover, lift up the lock lever, and pull out the fibers.

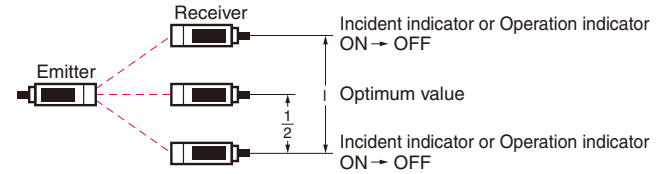


Note: 1. To maintain the fiber characteristics, make sure that the lock is released before removing the fibers.
2. Lock and unlock the fibers at an ambient temperature of -10 to 40°C .

● Adjustments

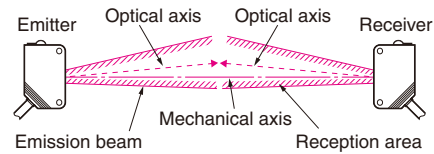
Optical Axis Adjustment

Move the Photoelectric Sensor both vertically and horizontally and set it in the center of the range in which the operation indicator is lit or not lit. For the E3S-C, the optical axis and the mechanical axis are the same, so the optical axis can be easily adjusted by aligning the mechanical axis.



Optical axis: The axis from the center of the lens to the center of the beam for the Emitter and the axis from the center of the lens to the center of the reception area for the Receiver.

Mechanical axis: The axis perpendicular to the center of the lens.



● Operating Environment

Water Resistance

Do not use in water, in rain, or outside.

Ambient Conditions

Do not use this Sensor in the following locations. Otherwise, it may malfunction or fail.

- (1) Locations exposed to excessive dust and dirt
- (2) Locations exposed to direct sunlight
- (3) Locations with corrosive gas vapors
- (4) Locations where organic solvents may splash onto the Sensor
- (5) Locations subject to vibration or shock
- (6) Locations where there is a possibility of direct contact with water, oil, or chemicals
- (7) Locations with high humidity and where condensation may result

Environmentally Resistive Sensors

The E32-T11F/T12F/T14F/T81F-S/D12F/D82F and E3HQ can be used in locations (3) and (6) above.

Optical Fiber Photoelectric Sensors in Explosive Gas Atmospheres

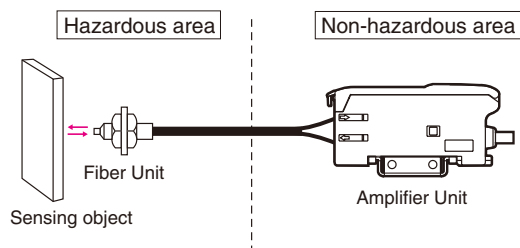
The Fiber Unit can be installed in the hazardous area, and the Amplifier Unit can be installed in a non-hazardous area.

<Reason>

For explosion or fire due to electrical equipment to occur, both the hazardous atmosphere and a source of ignition must be in the same location. Optical energy does not act as an ignition source, thus there is no danger of explosion or fire. The lens, case, and fiber covering are made of plastic, so this setup cannot be used if there is a possibility of contact with solvents that will corrode or degrade (e.g., cloud) the plastic.

<Ignition Source>

Electrical sparks or high-temperature parts that have sufficient energy to cause explosion in a hazardous atmosphere are called ignition sources.



Influence from External Electrical Fields

Do not bring a transceiver near the Photoelectric Sensor or its wiring, because this may cause incorrect operation.

● Maintenance and Inspection

Points to Check When the Sensor Does Not Operate

- If the Sensor does not operate, check the following points.
 - (1) Are the wiring and connections correct?
 - (2) Are any of the mounting screws loose?
 - (3) Are the optical axis and sensitivity adjusted correctly?
 - (4) Do the sensing object and the workpiece speed satisfy the ratings and specifications?
 - (5) Are any foreign objects, such as debris or dust, adhering to the Emitter lens or Receiver lens?
 - (6) Is strong light, such as sunlight (e.g., reflected from a wall), shining on the Receiver?
 - (7) Do not attempt to disassemble or repair the Sensor under any circumstances.
 - (8) If you determine that the Sensor clearly has a failure, immediately turn OFF the power supply.

Lens and Case

The lens and case of the Photoelectric Sensor are primarily made of plastic. Dirt should be gently wiped off with a dry cloth. Do not use thinner or other organic solvents.

- The case of the E3ZM, E3ZM-C and E3S-C is metal. The lens, however, is plastic.

● Accessories

Using a Reflector (E39-R3/R37/RS1/RS2/RS3)

During Application

- (1) When using adhesive tape on the rear face, apply it after washing away oil and dust with detergent. The Reflector cannot be mounted if there is any oil or dirt remaining.
- (2) Do not press on the E39-RS1/RS2/RS3 with metal or a fingernail. This may weaken performance.
- (3) This Sensor cannot be used in locations where oil or chemicals may splash on the Sensor.

M8 and M12 Connectors

- Be sure to connect or disconnect the connector after turning OFF the Sensor.
- Hold the connector cover to connect or disconnect the connector.
- Secure the connector cover by hand. Do not use pliers, otherwise the connector may be damaged.
- If the connector is not connected securely, the connector may be disconnected by vibration or the proper degree of protection of the Sensor may not be maintained.

● Others

Values Given in Typical Examples

The data and values given as typical examples are not ratings and performance and do not indicate specified performance. They are rather values from samples taken from production lots, and are provided for reference as guidelines. Typical examples include the minimum sensing object, engineering data, step (height) detection data, and selection list for specifications.

Cleaning

- Keep organic solvents away from the Sensor. Organic solvents will dissolve the surface.
- Use a soft, dry cloth to clean the Sensor.

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.

Warranty and Limitations of Liability

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.

Application Considerations

SUITABILITY FOR USE

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 catalog.
- 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.

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 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 product.

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

PERFORMANCE DATA

Performance data given in this catalog 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.

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 catalog shall not be copied for sales or promotions without permission.

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