## Compact Photoelectric Sensor with Built-in Amplifier

# E3Z

Photo electric Sensors

> Sensing Guide

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**Amplifiers** 

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Other Information The New Standard for Compact, Long-range Photoelectric Sensors Conserves Energy and Natural Resources

- Long sensing distance of 15 m for Through-beam Models, 4 m for Retro-reflective Models, and 1 m for Diffusereflective 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), IP67f oil resistance, mutual interference prevention, and EN standard compliance.
- Mechanical axis and optical axis offset always less than ±2.5° greatly simplifies optical axis alignment.



 $\epsilon$ 

Red light Infrared light

<u>∧</u>

Be sure to read Safety Precautions on

## Ordering Information

Sensors

Model Sensing method **Appearance** Connection method Sensing distance NPN output PNP output Pre-wired (2 m) \*3, \*4 E3Z-T61 \*6 E3Z-T81 \_\_\_\_15 m Standard M8 Connector E3Z-T66 E3Z-T86 Through-beam E3Z-T61A \*5 E3Z-T81A Pre-wired (2 m) \*3 **1**0 m Standard M8 Connector E3Z-T66A E3Z-T86A Pre-wired (2 m) E3Z-T61K E3Z-T81K Oil-resistive Through-**∑** 15 m beam Pre-wired M8 Connector E3Z-T61K-M3J E3Z-T81K-M3J Pre-wired (2 m) \*3, \*4 E3Z-R61 \*6 4 m \*2 E3Z-R81 Retro-reflective with MSR function (100 mm) Standard M8 Connector E3Z-R66 E3Z-R86 Oil-resistive Pre-wired (2 m) E3Z-R61K E3Z-R81K Retro-reflective with Pre-wired M8 Connector 3 m (150 mm) E3Z-R61K-M3J E3Z-R81K-M3J MSR function Pre-wired (2 m) \*3, \*4 E3Z-D61 E3Z-D81 5 to 100 mm Standard M8 Connector (wide view) E3Z-D66 E3Z-D86 Diffuse-reflective Pre-wired (2 m) \*3, \*4 E3Z-D62 \*5 E3Z-D82 \_1 m E3Z-D67 Standard M8 Connector E3Z-D87 E3Z-D61K E3Z-D81K Pre-wired (2 m) 5 to 100 mm Oil-resistive Diffuse-Pre-wired M8 Connector E3Z-D61K-M3J E3Z-D81K-M3J (wide view) reflective Pre-wired (2 m) E3Z-D62K E3Z-D82K Pre-wired M8 Connector E3Z-D62K-M3J E3Z-D82K-M3J Pre-wired (2 m) \*3 E3Z-LS61 \*5 E3Z-LS81 20 to 40 mm (BGS min setting) Distance-settable 20 to 200 mm (BGS max setting) Refer to page 140. Standard M8 Connector E3Z-LS66 E3Z-LS86 40 min. Incident threshold (FGS min setting) 200 min. Incident threshold (FGS max setting)

E3S-CL

Sensing method	d Appearance Connection method Sensing distance		Connection method	Sor	oneina dietonee		M	lodel
Sensing method			NPN output	PNP output				
Narrow-beam	<u></u>		Pre-wired (2 m) *3				E3Z-L61 *5	E3Z-L81
Reflective Refer to page 148.		•	Standard M8 Connector	90±30	mm		E3Z-L66	E3Z-L86
	ut MSR function for		Pre-wired (2 m) *3				E3Z-B61 *5	E3Z-B81
Retro-reflective with-			Standard M8 Connector	500 mm (80		mm)	E3Z-B66	E3Z-B86
clear, plastic bottles			Pre-wired (2 m) *3			*2	E3Z-B62 *5	E3Z-B82
Refer to page 152.			Standard M8 Connector		2 m (50		E3Z-B67	E3Z-B87
	1	axis	Pre-wired (2 m) *3				E3Z-G61 *5	E3Z-G81
Slit-type Through-	2	axes	rie-wiieu (Z III) 3	Πο <i>ε</i>			E3Z-G62 *5	E3Z-G82
beam Refer to page 156.	1	axis	Pre-wired M8 Connector	25 mn	1		E3Z-G61-M3J	E3Z-G81-M3J
rtoror to page 100.	2	axes	Pre-wired ivio Connector				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.

\*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-□6□-SOS□W-E□. The connector is the 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.
\*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

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

## Reflectors

Name	E3Z-R Sensing distance (typical)*	Model	Quantity	Remarks
	3 m (100 mm) (rated value)	E39-R1	1	
	4 m (100 mm) (rated value)	E39-R1S	1	
Reflector	5 m (100 mm)	E39-R2	1	
	2.5 m (100 mm)	E39-R9	1	
	3.5 m (100 mm)	E39-R10	1	Retro-reflective models are not provided with Reflectors.
Fog Preventive Coating	3 m (100 mm)	E39-R1K	1	The MSR function is enabled.
Small Reflector	1.5 m (50 mm)	E39-R3	1	The More function is chapted.
	700 mm (150 mm)	E39-RS1	1	
Tape Reflector	1.1 m (150 mm)	E39-RS2	1	
	1.4 m (150 mm)	E39-RS3	1	

Note: 1. 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. 2. Refer to *Reflectors* on page 295 for details.

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<sup>\*2.</sup> The sensing distance specified is possible when the E39-R1S used. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

<sup>\*3.</sup> 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).

<sup>\*</sup> Values in parentheses indicates the minimum required distance between the Sensor and Reflector.

#### **Mutual Interference Protection Filter**

Sensing Appearance/Dimensions Model Quantity Remarks distance Can be used with the E3Z-T□□A Through-beam Two sets each for the models. The arrow indicates the direction of po-E39-E11 **Emitter and Receiver** 3 m larized light. Mutual interference can be prevent-(total of four pieces) ed by altering the direction of polarized light from or to adjacent Emitters and Receivers.

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#### **Mounting Brackets**

Appear- ance	Model	Quantity	Remarks	Appear- ance	Model	Quantity	Remarks
	E39-L153	1	- Mounting Brackets *		E39-L98	1	Metal Protective Cover Bracket *
	E39-L104	1	Mounting brackers		E39-L150	1 set	(Sensor adjuster)
+	E39-L43	1	Horizontal Mounting Brackets		E39-L151	1 set	Easily mounted to the alumi- num frame rails of convey- ors and easily adjusted.
	E39-L142	1	Horizontal Protective Cover Bracket*	1	E39-L131	1 361	For left to right adjustment
	E39-L44	1	Rear Mounting Bracket *		E39-L144	1	Compact Protective Cover Bracket (For E3Z only) *

 $Note: 1. \ When using \ Through-beam \ models, order \ one \ bracket \ for \ the \ Receiver \ and \ one \ for \ the \ Emitter.$ 

#### **Sensor I/O Connectors**

Size	Cable	Appearance		Cable type		Model
	Standard	Straight	Ctroight			XS3F-M421-402-A
M8		Straight	O July and	5 m	4-wire	XS3F-M421-405-A
IVIO		L-shaped -	2 m	4-wile	XS3F-M422-402-A	
				5 m		XS3F-M422-405-A
		Straight		2 m		XS2F-D421-DC0-A
M12 (For -M1J				5 m	3-wire	XS2F-D421-GC0-A
models)		L-shaped		2 m		XS2F-D422-DC0-A
				5 m		XS2F-D422-GC0-A

Note: Refer to Sensor I/O Connectors on page 1182.

E3S-C E3S-CL E3G

Refer to Mounting Brackets on page 292 for details.
 \* Cannot be used for Standard Connector models.

## **Ratings and Specifications**

		Sensing method	Throug	h-beam	Retro-reflective v	vith MSR function	Diffuse-reflective		
		NPN output	E3Z-T61(K)/T66	E3Z-T61A/T66A	E3Z-R61/R66	E3Z-R61K	E3Z-D61(K)/D66	E3Z-D62(K)/D67	
Item	Model	PNP output	E3Z-T81(K)/T86	E3Z-T81A/T86A	E3Z-R81/R86	E3Z-R81K	E3Z-D81(K)/ D86	E3Z-D82(K)/ D87	
Sensing distance		15 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 dia	ameter								
Standar	d sensi	ng object	Opaque: 12-mm d	ia. min.	Opaque: 75-mm dia	a. min.	-		
Minimur object	m detec	table							
Differen	tial trav	rel					20% max. of set	ting distance	
Directio	nal ang	le	Both emitter and receiver: 3 to 15°	Both emitter and receiver: 3 to 15°	2 to 10°		-		
Light so	ource (w	avelength)	Infrared LED (870 nm)	Red LED (660 nm)	Red LED (660 nm)		Infrared LED (86	60 nm)	
Power s	supply v	oltage	12 to 24 VDC±10%	%, ripple (p-p): 10%	max.				
Current	consur	mption	Emitter: 15 mA Receiver: 20 mA		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 postection, Output short-circuition, and Reversed output protection			ort-circuit protec-	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.									
Sensitiv	ity adju	stment	One-turn adjuster						
Ambien			Incandescent lamp Sunlight: 10,000 lx						
Ambien	t tempe	rature	Operating: -25 to	55°C, Storage: –40	to 70°C (with no icir	ng or condensation)			
Ambien	t humid	lity	Operating: 35% to	85%, Storage: 35%	% to 95% (with no co	ndensation)			
Insulatio	on resis	tance	20 MΩ min. at 500	VDC					
Dielectri	ic stren	gth	1,000 VAC, 50/60 Hz for 1 min						
Vibratio	n resist	ance	Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions						
Shock re	esistan	се	Destruction: 500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions						
Degree	of prote	ection	IP67 (IEC 60529), Oil resistive models: IP67 (IEC 60529) (JEM standard: IP67f, excluding cables and connectors)						
Connec	Connection method Pre-wired cable (standard length: 2 m or 500 mm), Standard M8 Connector, Pre-wired M8 Connector (Connection method models only)					ctor (Oil-resistive			
Indicator Operation indicator (orange) Stability indicator (green) Emitter has power indicator (orange) only.									
Pre-wired cable (2 m)		ed cable	Approx. 120 g		Approx. 65 g				
Weight (packed			Approx. 30 g	orox. 30 g Approx. 20 g					
state)		ed M8 Con- (oil-resistive only)	Approx. 50 g	Approx. 50 g Approx. 30 g					
Materi-	Case		PBT (polybutylene	terephthalate)	1				
al	Lens		Modified polyaryla	te resin	Methacrylic resin		Modified polyary	late resin	
	ories		. , ,		,	kets are provided wit	. , ,		

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.

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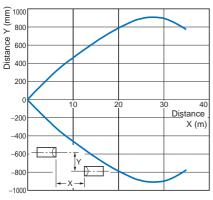
Built-in

## **Engineering Data (Typical)**

## **Parallel Operating Range**

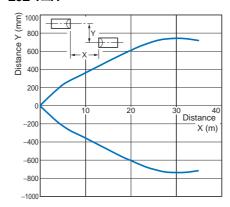
## **Through-beam Models**

E3Z-T□1(R□6)



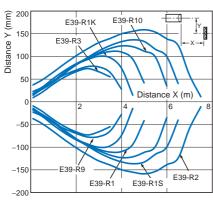
## **Through-beam Models**

E3Z-T□A



## **Retro-reflective Models**

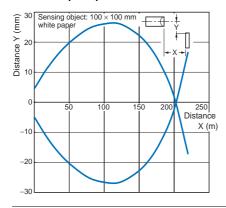
### E3Z-R□1(R□6) and Reflector



## **Operating Range**

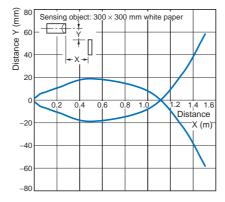
## **Diffuse-reflective Models**

E3Z-D□1(D□6)



## **Diffuse-reflective Models**

E3Z-D□2(D□7)



E3Z E3Z-LS E3Z-L E3Z-B

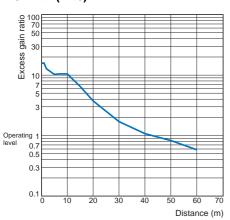
E3Z-G

E3T E3S-C E3S-CL

### **Excess Gain vs. Set Distance**

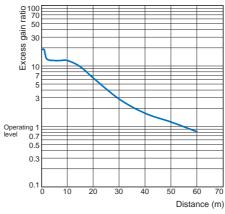
## **Through-beam Models**

## E3Z-T□1(T□6)



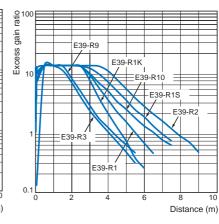
## **Through-beam Models**

### E3Z-T□A



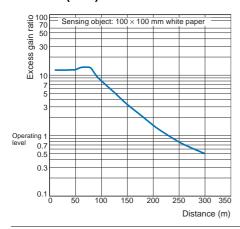
## **Retro-reflective Models**

## E3Z-R□1(R□6) and Reflector



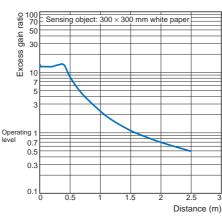
### **Diffuse-reflective Models**

### E3Z-D□1(D□6)



#### **Diffuse-reflective Models**

## E3Z-D□2(D□7)



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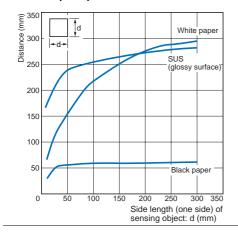
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## Sensing Object Size vs. Sensing Distance

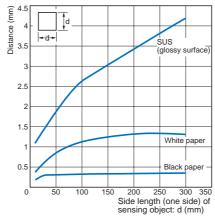
#### **Diffuse-reflective Models**

## E3Z-D□1(D□6)



#### **Diffuse-reflective Models**

## E3Z-D□2(D□7)



E3Z E3Z-LS

E3Z-L

E3Z-B E3Z-G

E3T

E3S-C E3S-CL

## I/O Circuit Diagrams

#### **NPN Output**

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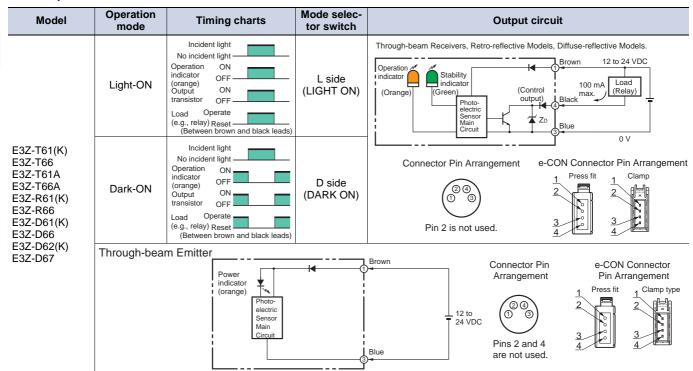
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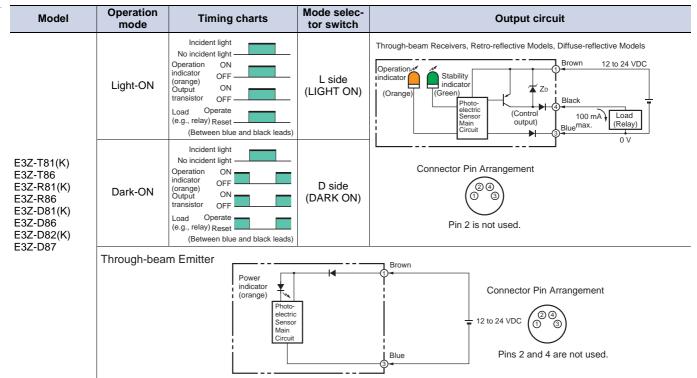
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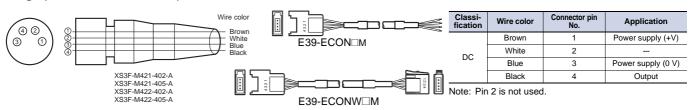
Other Information



## **PNP Output**



#### Plugs (Sensor I/O Connectors)



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E3Z-B

E3Z-G

E3T

E3S-C

E3S-CL

F3G

### **Nomenclature**

**Through-beam Models** E3Z-T□□ (Emitter)

E3Z-T□□A (Receiver) Diffuse-reflective **Models** E3Z-D

**Retro-reflective Models** 

E3Z-R□□

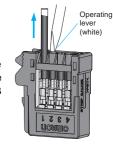


## **Procedure for Adjusting Cable Length** (Clamp-type e-CON Pre-wired Connector)

#### 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.)



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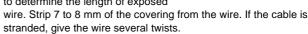
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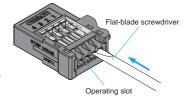
## Cable Length Adjustment **Procedure**

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

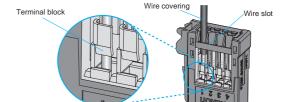


## Wiring Procedure

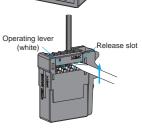
- 1. Use the flat-blade precision screwdriver to check and see if the lever is locked down in the operating slot.
- 2. Insert the wires into the wire slots as far as they will go. Make sure the tip of the conductors have passed all the way through the terminal block.



STRIP GAUGE



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.)

E3Z E3Z-LS

E3Z-L E3Z-B

E3Z-G

E3T E3S-C

E3S-CL F3G

## **Safety Precautions**

### Refer to Warranty and Limitations of Liability on page F-2.



**WARNING** 

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



#### **Precautions for Correct Use**

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## M8 Metal Connector

connector.

• Be sure to connect or disconnect the metal connector after turning

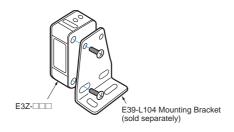
OFF the Sensor.Hold the connector cover to connect or disconnect the metal

- 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-resistive Models

#### Oil Resistance

- Although the E3Z-\\
   \| \subseteq \text{IM} 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	JIS classifi- cation	Product name	Kinematic viscosity (mm²/s) at 40°C	рН	
Lubri- cant		Velocity No.3	2.02		
Water insolu-	Class 2, No. 5	Daphne Cut AS-30D	No less than 10 to no less than 50		
chining oil	Class 2, No. 11	Yushiron Oil No.2 ac	Less than 10		
	Class W1,	Yushiroken EC50T-3		7 to 9.5	
Water	No.1	Yushiron Lubic HWC68		7 to 9.9	
soluble machin- ing oil	Class W1, No.2	Gryton 1700D		7 to 9.2	
	Class W2, No.1	Yushironken S50N		7 to 9.8	

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

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

E3Z-LS
E3Z-LS
E3Z-L
E3Z-B
E3Z-G
E3T

E3S-C

E3S-CL

**Dimensions** (Unit: mm)

#### **Sensors**

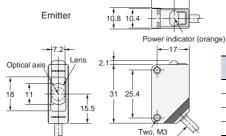
## Through-beam

**Pre-wired Models** E3Z-T61(K) E3Z-T81(K)

E3Z-T61A

E3Z-T81A





Power indicator (orange)

10.8 10.4

15.5

Stability indicator (green)

25.4

V4-dia. vinvl-insulated round cable with

Two, M3

onductors (Conductor cross section: 0.2 mm², Insulator diameter: 1.1 mm), Standard length: 2m

-20

Receiver

18

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

8.8

Operation selector

Terminal

No.

2

3

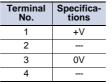
4

Pin 2 is not used.

Sensitivity adjuste

CAD data





Pins 2 and 4 are not used.

CAD data

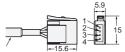
Specifica-

+V

0V

Output



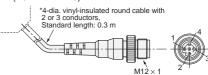


\*4-dia. vinyl-insulated round cable with 2 or 3 conductors, Standard length: 2 m

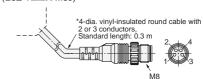


\*4-dia. vinyl-insulated round cable with 2 or 3 conductors, Standard lengths: 0.3 m, 0.5 m, and 2 m

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



M8 Pre-wired Connector (E3Z-T□□K-M3J)



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

Clamp-type e-CON Pre-wired Connector

—18*-*

Separate Amplifiers

> Built-in **Amplifiers**

Sensing Guide

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Other Information

## Through-beam

## **Standard Connector Models**

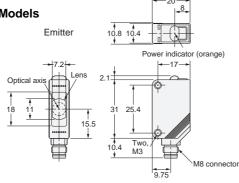
E3Z-T66

E3Z-T86

**E3Z-T66A** 

E3Z-T86A





CAD data

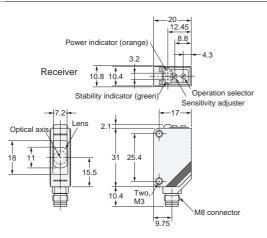
CAD data

E3Z E3Z-LS E3Z-L

> E3Z-B E3Z-G

E3T

E3S-C E3S-CL



Photoelectric Sensors

Sensing Guide

> Optical Fibers Separate

Amplifiers
Built-in

Amplifiers Built-in

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Other Information

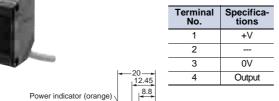
## **Retro-reflective Models**

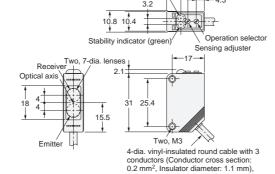
Pre-wired Models E3Z-R61(K) E3Z-R81(K)

**Diffuse-reflective Models** 

Pre-wired Models E3Z-D61(K) E3Z-D81(K) E3Z-D62(K)

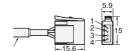
E3Z-D82(K)





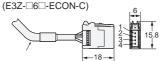
Standard length: 2m

20—<del>-</del> 12.45 CAD data Press-fit e-CON Pre-wired Connector



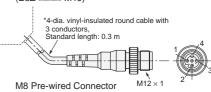
\*4-dia. vinyl-insulated round cable with 3 conductors, Standard length: 2 m

Clamp-type e-CON Pre-wired Connector

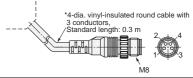


\*4-dia. vinyl-insulated round cable with 3 conductors. Standard lengths: 0.3 m, 0.5 m, and 2 m

M12 Pre-wired Connector (E3Z-\(\sigma\)-M1J)



(E3Z-T□□K-M3J)



CAD data

## **Retro-reflective Models**

Standard Connector Models E3Z-R66

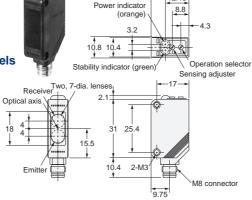
**Diffuse-reflective Models** 

Standard Connector

Models E3Z-D66 E3Z-D86 E3Z-D67

E3Z-R86

E3Z-D67



E3Z-LS

E3Z

E3Z-L E3Z-B

E3Z-G

E3T

E3S-C

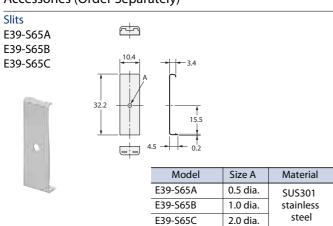
E3S-CL

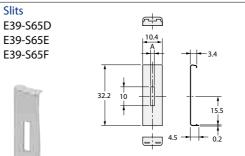
### e-CON Connector Configurations

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

#### Photoelectric Sensors

## Accessories (Order Separately)





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

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Reflectors

Refer to page 295 for details.

**Mounting Brackets** 

Refer to 292 for details.

Cat. No. E805-E1-01

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



## **Authorised Distributors:-**

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E3Z-LS
E3Z-L

E3Z-B E3Z-G

E3T E3S-C

E3S-CL E3G