Stainless Steel Housing (Compact Photoelectric Sensor with Built-in Amplifier)

E3ZM

Stainless-Steel Housing (SUS316L) - Ideal for the Food Industry! PAT Pending

- Excellent resistance to detergents, disinfectants and jet water spray
- Ecolab Europe certification acquired
- E3Z-size world's smallest square metal photoelectric sensor
- Reversed output polarity protection, external light interference algorithm, etc.
- Complete Compliance with RoHS

CE

⚠ Be sure to read *Safety Precautions* on page 13.

Features

World's Strongest

Withstands Detergent and Disinfectant Spray

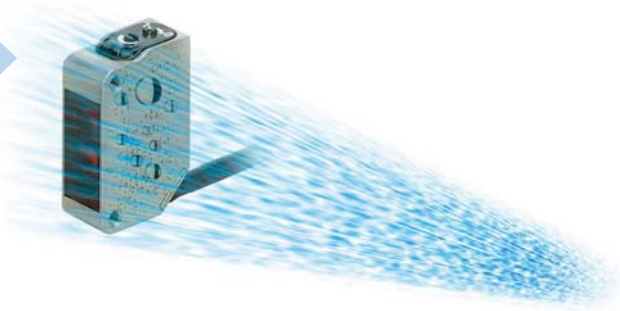
We used SUS316L for the case and the best material for all parts to achieve 200 times the durability of the E3Z (in 1.5% solution of sodium hydroxide at 70˚C) to make the E3ZM suitable for the cleaning conditions of food-processing machinery.

World's First

Superior Protective Structure

The first IP69K* (DIN 40050-9) protective structure in the world for a square metal photoelectric sensor. Suitable for high-temperature, high-pressure jet water spray cleaning applications.

* Refer to the footnote on page 5 (ratings and specifications table).



Industry's Best

Shape and Markings Designed for Greater Hygiene

Few indentations in the shape means less dust and water can collect, making the E3ZM more hygienic. No labels have been used in order to prevent foreign matter contaminating food products. The E3ZM model and lot numbers are imprinted using a laser marker.

Structural Design That Provides Excellent Environment-resistance*

Indicator cover: Polyethersulfone (PES)

Excellent resistance to detergents and disinfectants.

Waterproofing ring: Fluorine rubber

Excellent resistance to detergents and disinfectants.

Sensitivity adjustment and mode selector switch: Polyetheretherketone (PEEK)

Excellent resistance to detergents and disinfectants. Also has excellent abrasion resistance.

Optical plate: Polymethylmethacrylate (PMMA)

Excellent resistance to detergents and disinfectants. High transparency and other qualities give PMMA excellent optical characteristics.

Case: SUS316L

Excellent corrosion resistance to many chemical reagents.

Seal

The seal provides the durability to high-temperature and high-pressure water that complies with IP69K.

Cable: Polyvinylchloride

Excellent resistance to detergents and disinfectants.

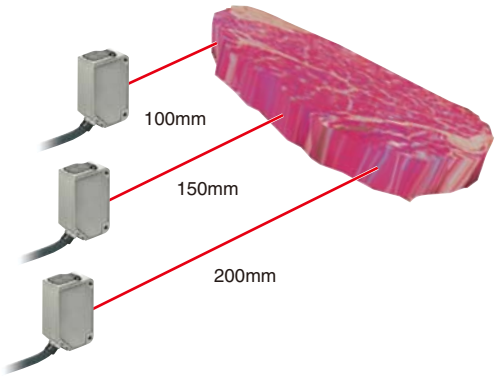
*Do not use the E3ZM in an oily environment.

Unique Members of the E3ZM Family

BGS Reflective Models

E3ZM-LS6□H/-LS8□H

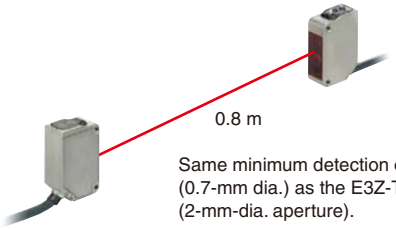
Three models with different fixed sensitivity (rated sensing distances) have been created. These models cover the sensing ranges of the E3Z-LS61.



Through-beam Inner Aperture Models

E3ZM-T63

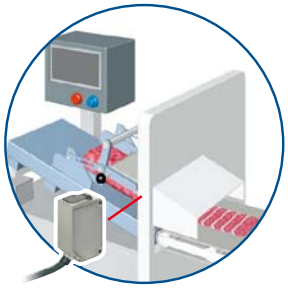
Fine beam without attaching an external aperture. This eliminates malfunctions from residual water drops, even immediately after washing.



Same minimum detection object (0.7-mm dia.) as the E3Z-T61+E39-S65C (2-mm-dia. aperture).

A Better Fit for the Application

The E3ZM can be used in those harsh cleaning environments in which the E3Z was difficult to use. E3ZM passed the material resistance tests and is certified by Ecolab.



Processing and wrapping of meat or raw food products

ECOLAB

Ecolab GmbH & Co. OHG
P.O. Box 13 04 06
D-40551 Düsseldorf

certifies that for

OMRON

OMRON Manufacturing of Germany GmbH
Carl-Benz-Strasse 4
71154 Nufringen

material resistance tests

were performed with cleaning substances **P3-topax 56, P3-topax 66, P3-topax 91, P3 Topactiv DES** and demineralized water as a zero reference factor.

The material resistance of the tested series

Photoelectric Sensor E3ZM

to the P3 products used in the test can be considered to be positive according to the cleaning procedure mentioned overleaf.

Düsseldorf, 14th February 2006

Ecolab GmbH & Co. OHG

i.V. **Thomas Tyborski**

i. V. **Reimund Laaff**

ECOLAB

This certificate is based on:

- documented test procedures (test no.: F&E/P3-E Nr. 40-1) according to material resistance
- defined product descriptions
- standardized cleaning procedure

Test procedure
Ecolab-test F&E Nr. 40-1

Dipping test:
- Complete immersion in solutions/liquid

Test period:
- 14 days

Temperature:
- room temperature (constant)

Analysis:
- Visual judgement like swelling, brittleness, discoloring
- compared to zero-reference factor (demineralized water)
- Photometric documentation

Product specifications:

P3-topax 56:
Acid foam cleaning substance for food industry

P3-topax 66:
Alkaline cleaning detergent with active chlorine for machine cleaning in food and beverage industry

P3-topax 91:
Neutral disinfection agent based on quaternary ammonium compounds (QAV) for food industry

P3-topactive DES:
Acid disinfectant based on Peracetic Acid and Hydrogen Peroxide for the food and beverage industry

Cleaning plan for food and beverage industry*

Rinsing with water 40 – 50°C
Rinsing with low pressure. Rinsing from top to bottom in the direction of the drains. Cleaning of the drains.

Foaming from bottom to top
alkaline: P3-topax 66 2 – 5 % daily
acid: P3-topax 56 2 % on demand
temperature: cold up to 40°C
contact time: 15 min. recommended

Rinsing with water 40 – 50°C
Rinsing from top to bottom with low pressure

Spray disinfection P3-topax 91 1-2 %, 30 -60 minutes

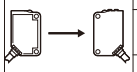
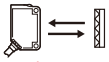
Foam disinfection P3-topactive DES 1-2 %, 10-30 minutes

*short description

Ordering Information

Sensors

Red light Infrared light

Sensing method	Appearance	Connection method	Sensing distance	Model	
				NPN output	PNP output
Through-beam *5		Pre-wired (2 m) *3	15 m	E3ZM-T61	E3ZM-T81
		Connector (M8, 4 pins) *4		E3ZM-T66	E3ZM-T86
		Pre-wired (2 m) *3	0.8 m (apertures built in)	E3ZM-T63	E3ZM-T83
		Connector (M8, 4 pins) *4		E3ZM-T68	E3ZM-T88
Retro-reflective with MSR function	 *1	Pre-wired (2 m) *3	*2 4 m (100 mm) (Using E39-R1S)	E3ZM-R61	E3ZM-R81
		Connector (M8, 4 pins) *4		E3ZM-R66	E3ZM-R86
Diffuse-reflective		Pre-wired (2 m) *3	1 m	E3ZM-D62	E3ZM-D82
		Connector (M8, 4 pins) *4		E3ZM-D67	E3ZM-D87
BGS reflective (fixed distance)		Pre-wired (2 m) *3	10 to 100 mm	E3ZM-LS61H	E3ZM-LS81H
		Connector (M8, 4 pins) *4		E3ZM-LS66H	E3ZM-LS86H
		Pre-wired (2 m) *3	10 to 150 mm	E3ZM-LS62H	E3ZM-LS82H
		Connector (M8, 4 pins) *4		E3ZM-LS67H	E3ZM-LS87H
		Pre-wired (2 m) *3	10 to 200 mm	E3ZM-LS64H	E3ZM-LS84H
		Connector (M8, 4 pins) *4		E3ZM-LS69H	E3ZM-LS89H

*1. The Reflector is sold separately. Select the Reflector model most suited to the application.
*2. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.
*3. Pre-wired Models with a 5-m cable are also available for these products. When ordering, specify the cable length by adding "5M" to the end of the model number (e.g., E3ZM-LT61 5M).
M12 Pre-wired Connector Models are also available. When ordering, add "-M1J" to the end of the model number (e.g., E3ZM-R61-M1J 0.3m).
*4. M8 Connector Models are also available with three-pin connectors. When ordering, add "-M5" to the end of the model number (e.g., E3ZM-T66-M5).
This does not apply to BGS Reflective Models, however, because they require 4 pins.
*5. Through-beam Models are also available with a light emission stop function. When ordering, add "-G0" to the end of the model number (e.g., E3ZM-T61-G0).

Accessories

Reflectors

Name	E3ZM-R Sensing distance (typical) *	Model	Quantity	Remarks
Reflector	3 m (100 mm) (rated value)	E39-R1	1	• Reflectors are not provided with Retro-reflective models. • 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: When using a Reflector without a rated value, use 0.7 times typical value as a guideline for the sensing distance.
* Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

Mounting Brackets

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

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

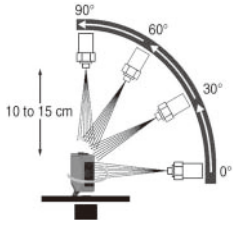
Size	Cable	Appearance		Cable type		Model
M8 (4 pins)	Standard	Straight		2 m	4-wire	**XS3F-M421-402-A**
				5 m		**XS3F-M421-405-A**
		L-shaped		2 m		**XS3F-M422-402-A**
				5 m		**XS3F-M422-405-A**
M12 (For -M1J models)		Straight		2 m	3-wire	**XS2F-D421-DC0-A**
				5 m		**XS2F-D421-GC0-A**
		L-shaped		2 m		**XS2F-D422-DC0-A**
				5 m		**XS2F-D422-GC0-A**
		Straight		2 m	4-wire	**XS2F-D421-D80-A**
				5 m		**XS2F-D421-G80-A**
		L-shaped		2 m		**XS2F-D422-D80-A**
				5 m		**XS2F-D422-G80-A**

*1. The performance will be IP67 because of the connector specifications.
*2. Cable specifications: Outer coating material: PVC, Nut material: Stainless steel, Degree of protection: IP67 (IEC 60529)

Ratings and Specifications

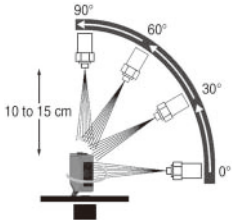
Item		Sensing method	Through-beam		Retro-reflective with MSR function	Diffuse-reflective Models
Model		NPN output	E3ZM-T61 E3ZM-T66	E3ZM-T63 E3ZM-T68	E3ZM-R61 E3ZM-R66	E3ZM-D62 E3ZM-D67
		PNP output	E3ZM-T81 E3ZM-T86	E3ZM-T83 E3ZM-T88	E3ZM-R81 E3ZM-R86	E3ZM-D82 E3ZM-D87
Sensing distance			15 m	0.8 m	4 m [100 mm] (Using E39-R1S) 3 m [100 mm] (Using E39-R1)	1 m (White paper 300 × 300 mm)
Spot diameter (typical)			---			
Standard sensing object			Opaque: 12-mm dia. min.	Opaque: 2-mm dia. min.	Opaque: 75-mm dia. min.	---
Differential travel			---			20% of sensing distance max.
Black/white error			---			
Directional angle			Emitter, Receiver: 3° to 15°		Sensor: 3° to 10° Reflector: 30°	---
Light source (wavelength)			Infrared LED (870 nm)		Red LED (660 nm)	Infrared LED (860 nm)
Power supply voltage			10 to 30 VDC, including 10% ripple (p-p)			
Current consumption			40 mA max. (Emitter 20 mA max., Receiver 20 mA max.)		25 mA max.	
Control output			Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 2 V max.) Open-collector output (NPN/PNP output depending on model) Light-ON/Dark-ON switch 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.			
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 *			IEC: IP67, DIN 40050-9: IP69K			
Connection method			Pre-wired cable (standard length: 2 m) M8 4-pin Connector			
Indicator			Operation indicator (yellow), Stability indicator (green) (Emitter has only power supply indicator (green).)			
Weight (packed state)	Pre-wired models (with 2-m cable)		Approx. 150 g		Approx. 90 g	
	Connector models		Approx. 60 g		Approx. 40 g	
Materials	Case		SUS316L			
	Lens		PMMA (polymethylmethacrylate)			
	Display		PES (polyethersulfone)			
	Sensitivity adjustment and mode selector switch		PEEK (polyetheretherketone)			
	Seals		Fluoro rubber			
Accessories			Instruction sheet (Note: Reflectors and Mounting Brackets are sold separately.)			

* IP69K Degree of Protection Specifications
IP69K is a protection specification stipulated by DIN 40050 Part 9 of the German standards.
The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute.
The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.



Item		Sensing method	BGS Reflective Models		
	Model	NPN output	E3ZM-LS61H E3ZM-LS66H	E3ZM-LS62H E3ZM-LS67H	E3ZM-LS64H E3ZM-LS69H
		PNP output	E3ZM-LS81H E3ZM-LS86H	E3ZM-LS82H E3ZM-LS87H	E3ZM-LS84H E3ZM-LS89H
Sensing distance			10 to 100 mm (White paper 100 × 100 mm)	10 to 150 mm (White paper 100 × 100 mm)	10 to 200 mm (White paper 100 × 100 mm)
Spot diameter (typical)			4-mmdia. at sensing distance of 100 mm	12-mmdia. at sensing distance of 150 mm	18-mmdia. at sensing distance of 200 mm
Standard sensing object			---		
Differential travel			3% of sensing distance max.	15% of sensing distance max.	20% of sensing distance max.
Black/white error			5% of sensing distance max.	10% of sensing distance max.	20% of sensing distance max.
Directional angle			---		
Light source (wavelength)			Red LED (650 nm)	Red LED (660 nm)	
Power supply voltage			10 to 30 VDC, including 10% ripple (p-p)		
Current consumption			25 mA max.		
Control output			Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 2 V max.) Open-collector output (NPN/PNP output depending on model) Light-ON/Dark-ON cable connection selectable		
Protection circuits			Reversed power supply polarity protection, Output short-circuit protection, Reversed output polarity protection, Mutual interference protection		
Response time			Operate or reset: 1 ms max.		
Sensitivity adjustment			---		
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 *			IEC: IP67, DIN 40050-9: IP69K		
Connection method			Pre-wired cable (standard length: 2 m) M8 4-pin Connector		
Indicator			Operation indicator (yellow), Stability indicator (green)		
Weight (packed state)	Pre-wired models (with 2-m cable)		Approx. 90 g		
	Connector models		Approx. 40 g		
Materials	Case		SUS316L		
	Lens		PMMA (polymethylmethacrylate)		
	Display		PES (polyethersulfone)		
	Seals		Fluoro rubber		
Accessories			Instruction sheet (Note: Mounting Brackets are sold separately.)		

* IP69K Degree of Protection Specifications
IP69K is a protection specification stipulated by DIN 40050 Part 9 of the German standards.
The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute.
The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.

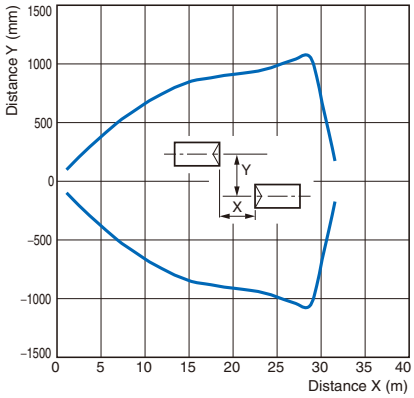


Engineering Data (Typical)

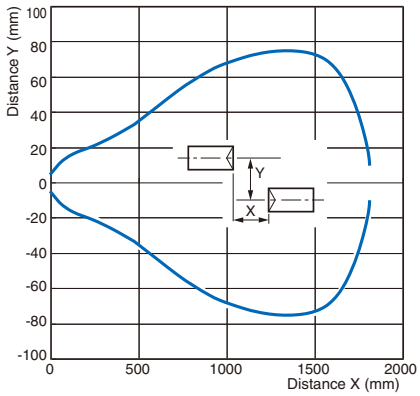
Parallel Operating Range

Through-beam Models

E3ZM-T□1(T□6)

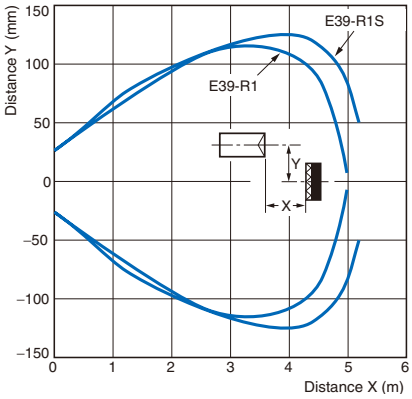


E3ZM-T□3(T□8)



Retro-reflective Models

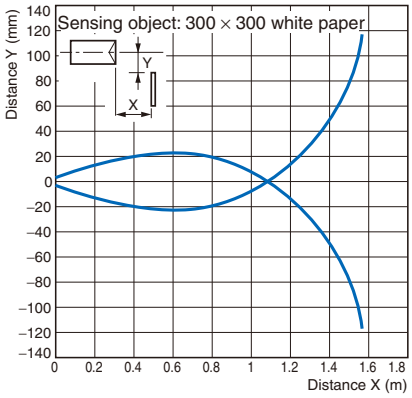
E3ZM-R□1(R□6)



Operating Range

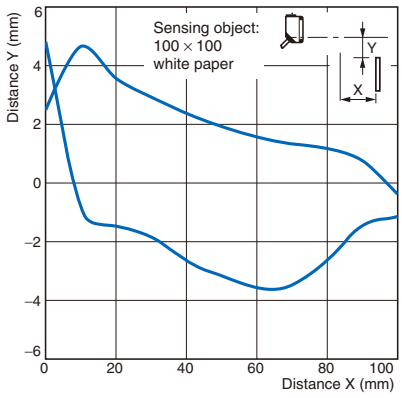
Diffuse-reflective Models

E3ZM-D□2(D□7)

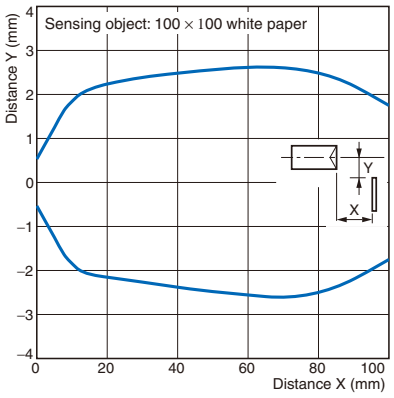


BGS Reflective Models

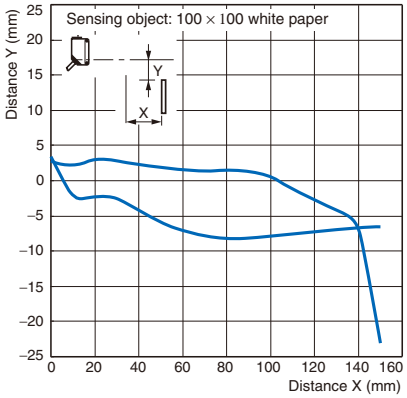
E3ZM-LS□1H(LS□6H), Top to Bottom



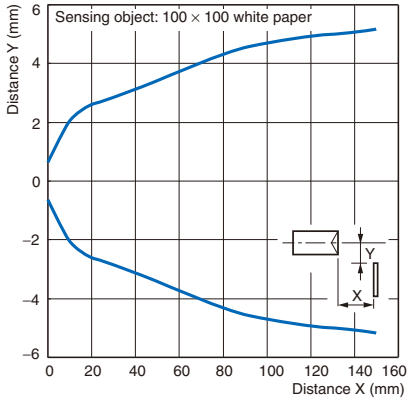
E3ZM-LS□1H(LS□6H), Left to Right



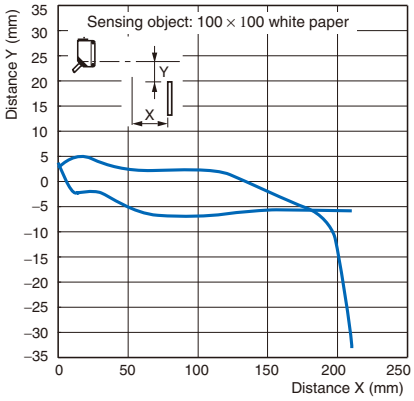
E3ZM-LS□2H(LS□7H), Top to Bottom



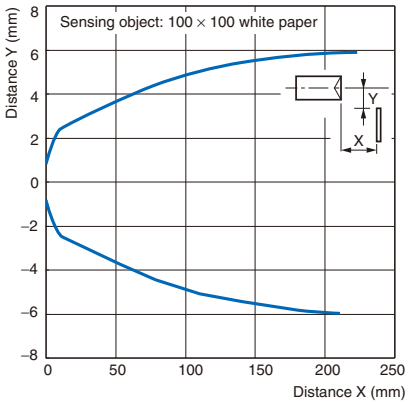
E3ZM-LS□2H(LS□7H), Left to Right



E3ZM-LS□4H(LS□9H), Top to Bottom



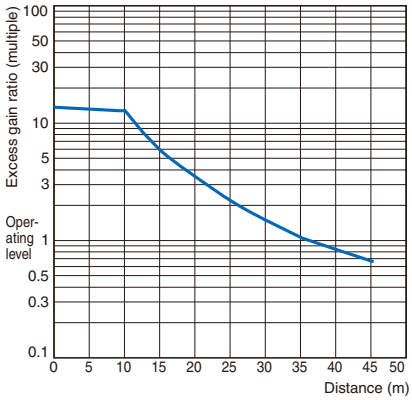
E3ZM-LS□4H(LS□9H), Left to Right



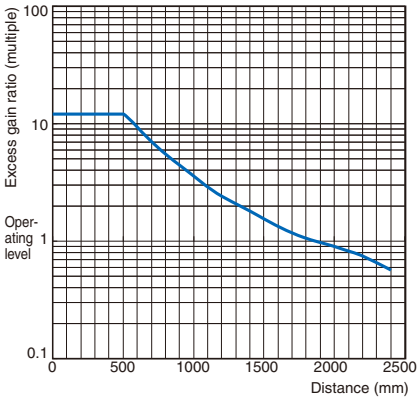
Excess Gain vs. Distance

Through-beam Models

E3ZM-T□1(T□6)

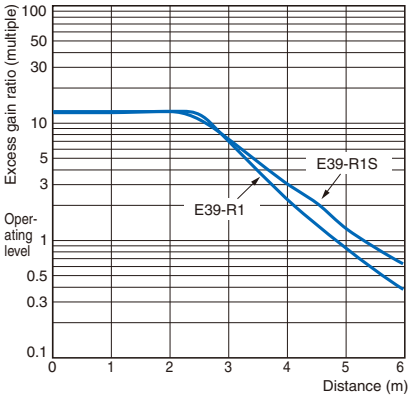


E3ZM-T□3(T□8)



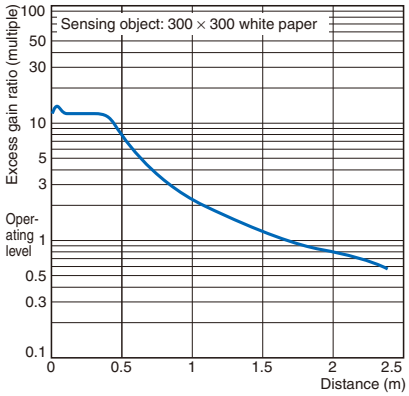
Retro-reflective Models

E3ZM-R□1(R□6)



Diffuse-reflective Models

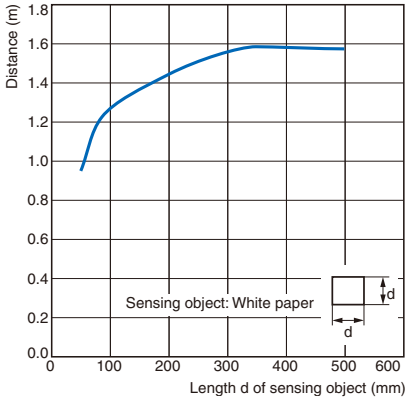
E3ZM-D□2(D□7)



Sensing Object Size vs. Distance

Diffuse-reflective Models

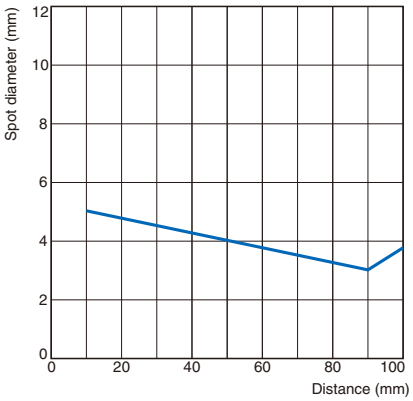
E3ZM-D□2(D□7)



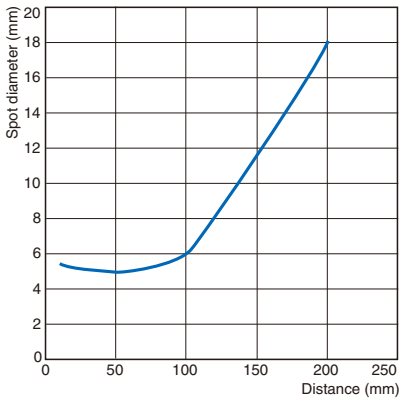
Spot Diameter vs. Distance

BGS Reflective Models

E3ZM-LS□1H(LS□6H)



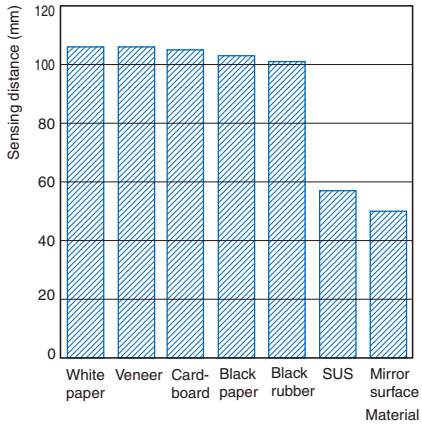
E3ZM-LS□2H/LS□4H(LS□7H/LS□9H)



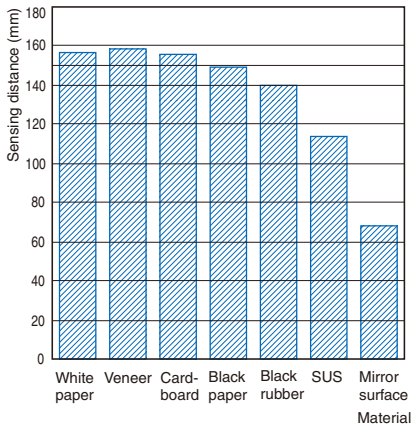
Sensing Distance vs. Sensing Object Material

BGS Reflective Models

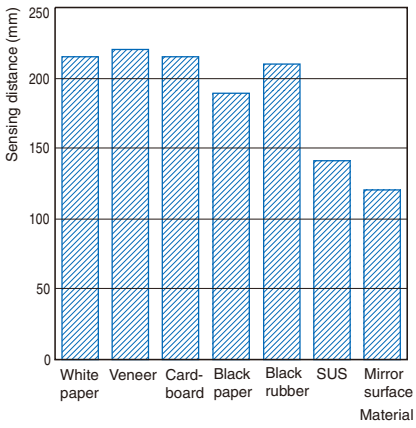
E3ZM-LS□1H(LS□6H)



E3ZM-LS□2H(LS□7H)



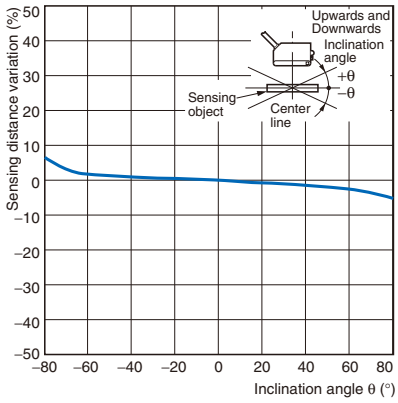
E3ZM-LS□4H(LS□9H)



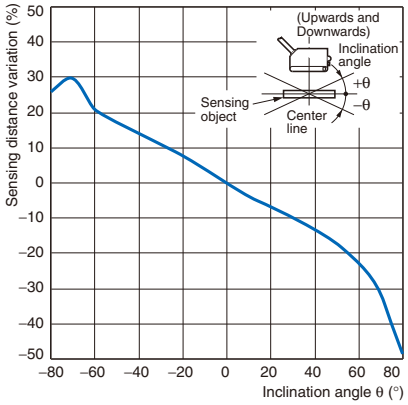
Inclination Characteristics (Vertical)

BGS Reflective Models

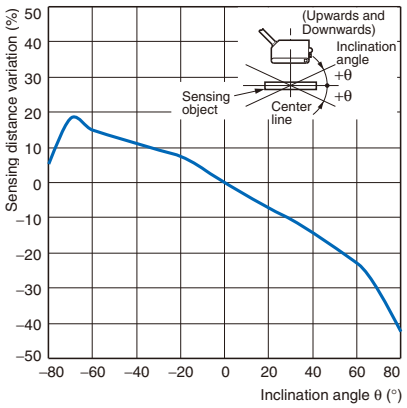
E3ZM-LS□1H(LS□6H)



E3ZM-LS□2H(LS□7H)



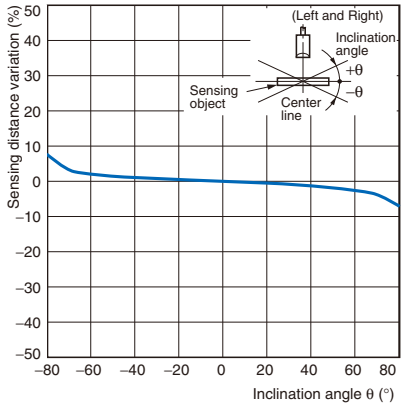
E3ZM-LS□4H(LS□9H)



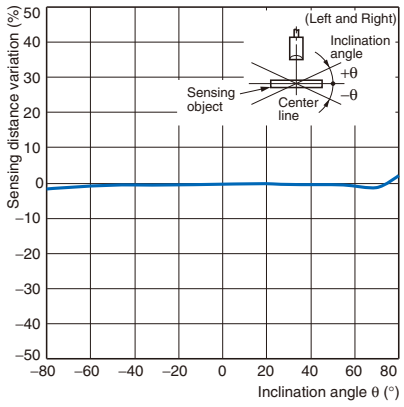
Inclination Characteristics (Horizontal)

BGS Reflective Models

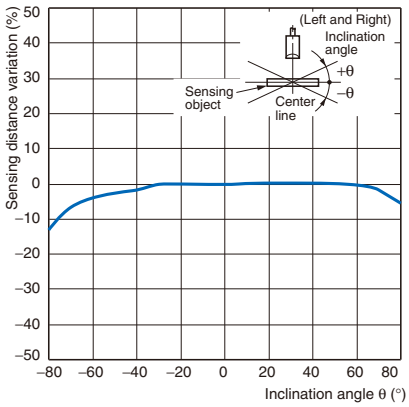
E3ZM-LS□1H(LS□6H)



E3ZM-LS□2H(LS□7H)

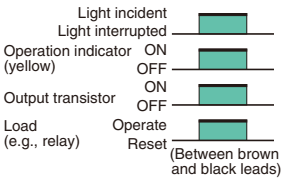
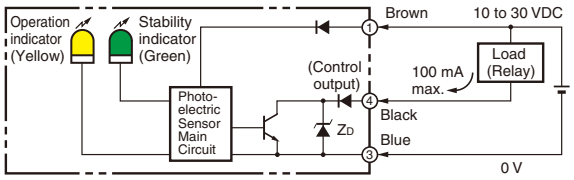


E3ZM-LS□4H(LS□9H)



I/O Circuit Diagrams

NPN Output

<table>
<tr><th>Model</th><th>Operation mode</th><th>Timing charts</th><th>Operation selector</th><th>Output circuit</th></tr>
<tr><td rowspan="3">E3ZM-T61
E3ZM-T63
E3ZM-T66
E3ZM-T68
E3ZM-R61
E3ZM-R66
E3ZM-D62
E3ZM-D67</td><td>Light-ON</td><td> 
</td><td>L side (LIGHT ON)</td><td rowspan="2">Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models
 
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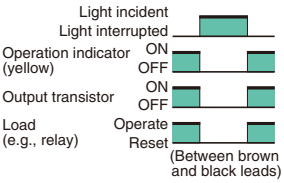
<tr><td>Dark-ON</td><td> 
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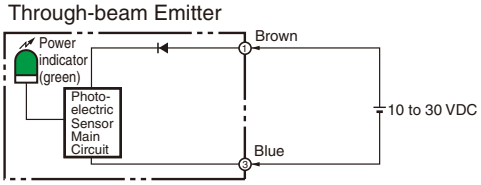
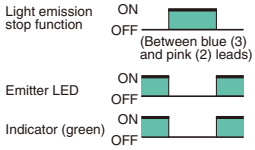
<tr><td colspan="4">Through-beam Emitter
 
</td></tr>
<tr><td>E3ZM-T61-G0
E3ZM-T63-G0
E3ZM-T66-G0
E3ZM-T68-G0</td><td>---</td><td> 
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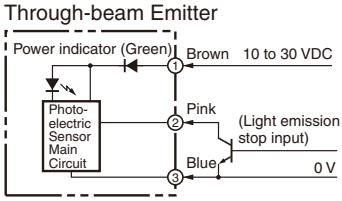
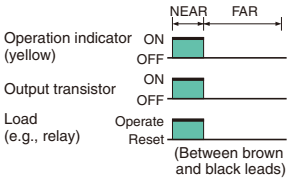
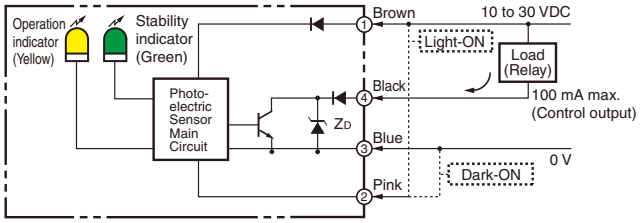
 
</td></tr>
<tr><td rowspan="2">E3ZM-LS61H
E3ZM-LS66H
E3ZM-LS62H
E3ZM-LS67H
E3ZM-LS64H
E3ZM-LS69H</td><td>Light-ON</td><td> 
</td><td>Connect pink lead (2) to brown lead (1).</td><td rowspan="2"> 
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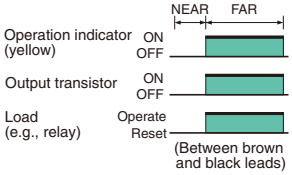
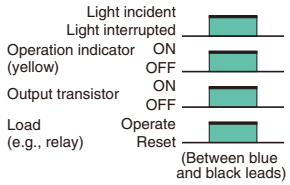
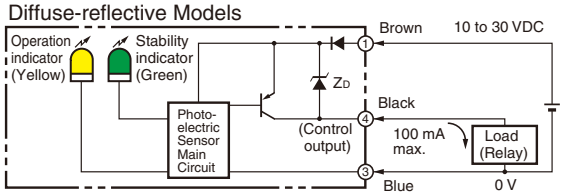
<tr><td>Dark-ON</td><td> 
</td><td>Connect pink lead (2) to blue lead (3) or leave open.</td></tr>
</table>

PNP Output

<table>
<tr><th>Model</th><th>Operation mode</th><th>Timing charts</th><th>Operation selector</th><th>Output circuit</th></tr>
<tr><td rowspan="3">E3ZM-T81
E3ZM-T83
E3ZM-T86
E3ZM-T88
E3ZM-R81
E3ZM-R86
E3ZM-D82
E3ZM-D87</td><td>Light-ON</td><td> 
</td><td>L side (LIGHT ON)</td><td rowspan="2">Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models
 
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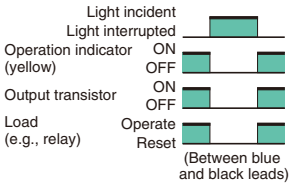
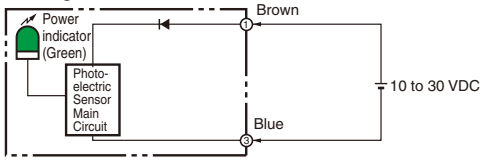
<tr><td>Dark-ON</td><td> 
</td><td>D side (DARK ON)</td></tr>
<tr><td colspan="3">Through-beam Emitter
 
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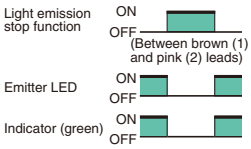
<tr><td>E3ZM-T81-G0
E3ZM-T83-G0
E3ZM-T86-G0
E3ZM-T88-G0</td><td>---</td><td> 
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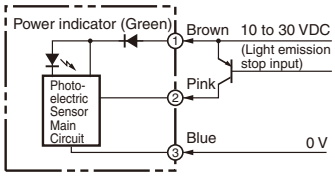
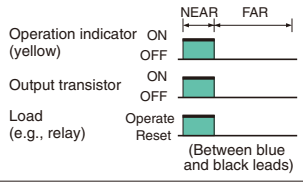
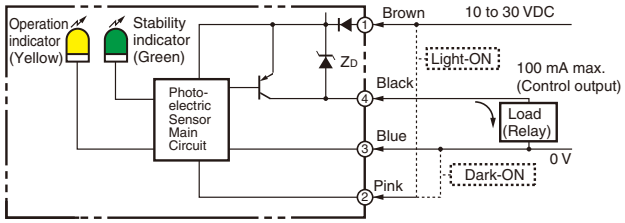
 
</td></tr>
<tr><td rowspan="2">E3ZM-LS81H
E3ZM-LS86H
E3ZM-LS82H
E3ZM-LS87H
E3ZM-LS84H
E3ZM-LS89H</td><td>Light-ON</td><td> 
</td><td>Connect pink lead (2) to brown lead (1).</td><td rowspan="2"> 
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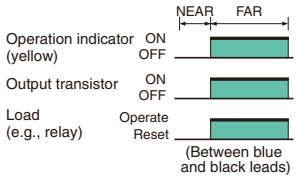
<tr><td>Dark-ON</td><td> 
</td><td>Connect pink lead (2) to blue lead (3) or leave open.</td></tr>
</table>

Connector Pin Arrangement

M8 Connector (-CN)/M8 Pre-wired Connector

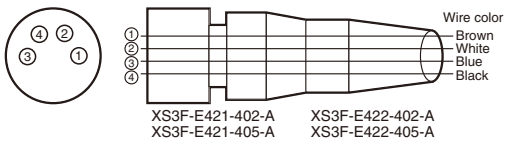
M8 4-pin Connector Pin Arrangement

M8 Pre-wired 3-pin Connector

M8 3-pin Connector Pin Arrangement

Plugs (Sensor I/O Connectors)

M8 4-pin Connectors



XS3F-E421-402-A
XS3F-E421-405-A

XS3F-E422-402-A
XS3F-E422-405-A

Nomenclature

Sensors with Sensitivity Adjustment and Mode Selector Switch

Through-beam Models

E3ZM-T□□ (Receiver)

Retro-reflective Models

E3ZM-R□□

Diffuse-reflective Models

E3ZM-D□□

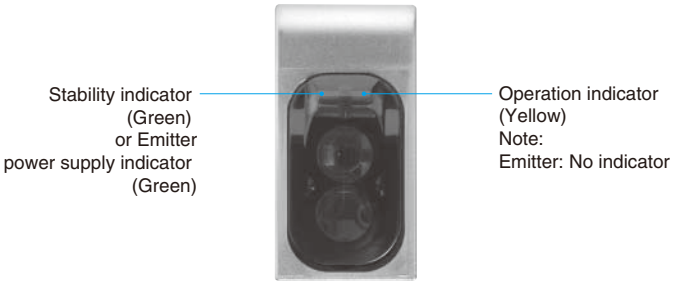
Infinite Adjustment Emitter

BGS Reflective Models

E3ZM-LS□□H

Through-beam Models

E3ZM-T□□ (Emitter)



Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠ WARNING

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

⚠ CAUTION

Do not use the product with voltage in excess of the rated voltage. Excess voltage may result in malfunction or fire.

Never use the product with an AC power supply. Otherwise, explosion may result.

When cleaning the product, do not apply a concentrated spray of water to one part of the product. Otherwise, parts may become damaged and the degree of protection may be degraded.

High-temperature environments may result in burn injury.

Precautions for Safe Use

The following precautions must be observed to ensure safe operation of the Sensor.

Operating Environment

Do not use the Sensor in an environment where explosive or flammable gas is present.

Connecting Connectors

Be sure to hold the connector cover when inserting or removing the connector.
If the XS3F is used, always tighten the connector cover by hand. Do not use pliers.
If the tightening is insufficient, the degree of protection will not be maintained and the Sensor may become loose due to vibration. The appropriate tightening torque is 0.3 to 0.4 N·m.
If other commercially available connectors are used, follow the recommended connector application conditions and recommended tightening torque specifications.

Load

Do not use a load that exceeds the rated load.

Low-temperature Environments

Do not touch the metal surface with your bare hands when the temperature is low. Touching the surface may result in a cold burn.

Rotation Torque for Sensitivity Adjustment and Selector Switch

Adjust with a torque of 0.06 N·m or less.

Oily Environments

Do not use the Sensor in oily environments.

Modifications

Do not attempt to disassemble, repair, or modify the Sensor.

Outdoor Use

Do not use the Sensor in locations subject to direct sunlight.

Cleaning

Do not use thinner, alcohol, or other organic solvents. Otherwise, the optical properties and degree of protection may be degraded.

Washing

Do not use highly concentrated detergents. They may cause malfunction. Do not use high-pressure water spray in excess of the specifications.

Surface Temperature

Burn injury may occur. The Sensor surface temperature rises depending on application conditions, such as the surrounding temperature and the power supply voltage. Use caution when operating or washing the Sensor.

Precautions for Correct Use

Do not install the Sensor in the following locations.

(1) Locations subject to direct sunlight
(2) Locations subject to condensation due to high humidity
(3) Locations subject to corrosive gas
(4) Locations where the Sensor may receive direct vibration or shock

Connecting and Mounting

(1) The maximum power supply voltage is 30 VDC. Before turning the power ON, make sure that the power supply voltage does not exceed the maximum voltage.
(2) Laying Sensor wiring in the same conduit or duct as high-voltage wires or power lines may result in malfunction or damage due to induction. As a general rule, wire the Sensor in a separate conduit or use shielded cable.
(3) Use an extension cable with a minimum thickness of 0.3 mm^2 and less than 100 m long.
(4) Do not pull on the cable with excessive force.
(5) Pounding the Photoelectric Sensor with a hammer or other tool during mounting will impair water resistance. Also, use M3 screws.
(6) Mount the Sensor either using the bracket (sold separately) or on a flat surface.
(7) Be sure to turn OFF the power supply before inserting or removing the connector.

Cleaning

Never use thinner or other solvents. Otherwise, the Sensor surface may be dissolved.

Power Supply

If a commercial switching regulator is used, ground the FG (frame ground) terminal.

Power Supply Reset Time

The Sensor will be able to detect objects 100 ms after the power supply is tuned ON. Start using the Sensor 100 ms or more after turning ON the power supply. If the load and the Sensor are connected to separate power supplies, be sure to turn ON the Sensor first.

Turning OFF the Power Supply

Output pulses may be generated even when the power supply is OFF. Therefore, it is recommended to first turn OFF the power supply for the load or the load line.

Load Short-circuit Protection

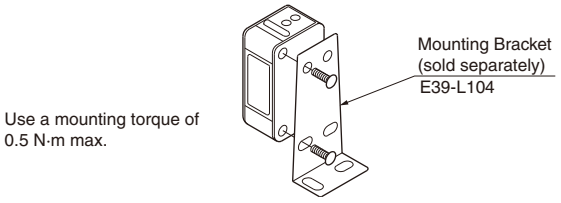
This Sensor is equipped with load short-circuit protection, but be sure to not short circuit the load. Be sure to not use an output current flow that exceeds the rated current. If a load short circuit occurs, the output will turn OFF, so check the wiring before turning ON the power supply again. The short-circuit protection circuit will be reset. The load short-circuit protection will operate when the current flow reaches 1.8 times the rated load current. When using a C load, use an inrush current of 1.8 times the rated load current or higher.

Water Resistance

Do not use the Sensor in water, rainfall, or outdoors.

When disposing of the Sensor, treat it as industrial waste.

Mounting Diagram



Resistance to Detergents, Disinfectants, and Chemicals

- Performance is assured for typical detergents and disinfectants, but performance may not be maintained for some detergents and disinfectants. Refer to the following table when using these agents.
- The E3ZM passed testing for resistance to detergents and disinfectants performed using the items in the following table. Refer to this table when considering use of detergents and disinfectants.

Category	Product name	Concentration	Temperature	Time
Chemical	Sodium hydroxide (NaOH)	1.5%	70°C	240h
	Potassium hydroxide (KOH)	1.5%	70°C	240h
	Phosphoric acid (H_3PO_4)	2.5%	70°C	240h
	Sodium hypochlorite (NaClO)	0.3%	25°C	240h
	Hydrogen peroxide (H_2O_2)	6.5%	25°C	240h
Alkaline foam detergent	P3-topax-66s (Manufactured by Ecolab)	3.0%	70°C	240h
Acidic foam detergent	P3-topax-56 (Manufactured by Ecolab)	5.0%	70°C	240h
Disinfectant	P3-oxonia active 90 (Manufactured by Ecolab)	1.0%	25°C	240h
	TEK121 (Manufactured by ABC Compounding)	1.1%	25°C	240h

Note: The Sensor was immersed in the chemicals, detergents, and disinfectants listed above at the temperatures in the table for 240 hours and then passed an insulation resistance of 100 MΩ min.

Dimensions

(Unit: mm)

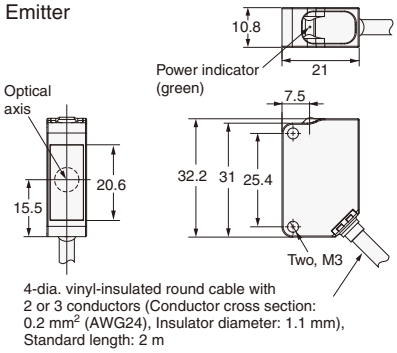
Sensors

Through-beam Models

Pre-wired Models

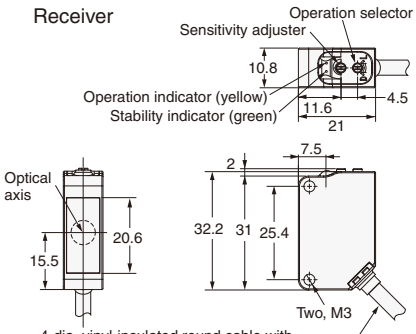
E3ZM-T61(-G0)
E3ZM-T81(-G0)
E3ZM-T63(-G0)
E3ZM-T83(-G0)

Emitter



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

Receiver



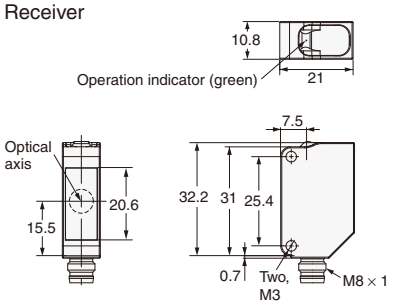
4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm^2 (AWG24), Insulator diameter: 1.1 mm), Standard length: 2m

Through-beam Models

Standard Connector

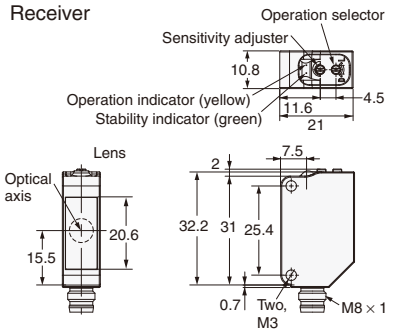
E3ZM-T66(-G0)
E3ZM-T86(-G0)
E3ZM-T68(-G0)
E3ZM-T88(-G0)

Receiver



Terminal No.	Specifications
1	+V
2	Light emission stop input (-G0 only)
3	0 V
4	---

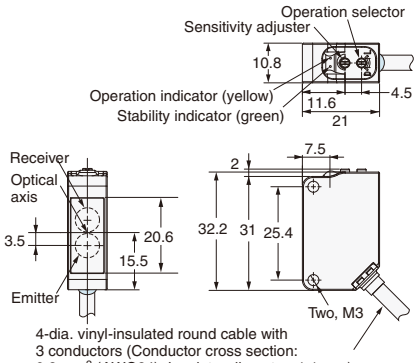
Receiver



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

Retro-reflective Models
Pre-wired Models
E3ZM-R61
E3ZM-R81

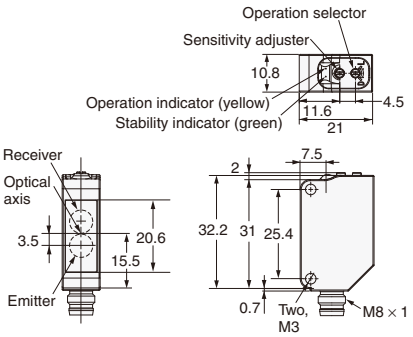
Diffuse-reflective Models
Standard Connector
E3ZM-D62
E3ZM-D82



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

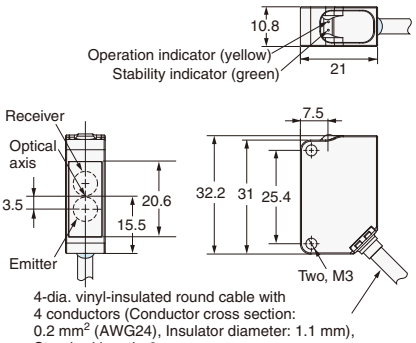
Retro-reflective Models
Standard Connector
E3ZM-R66
E3ZM-R86

Diffuse-reflective Models
Standard Connector
E3ZM-D67
E3ZM-D87



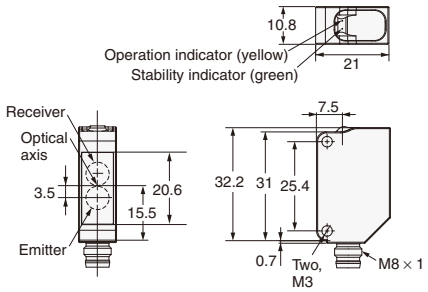
Terminal No.	Specifications
1	+V
2	---
3	0 V
4	Output

BGS Reflective Models
Pre-wired Models
E3ZM-LS61H
E3ZM-LS62H
E3ZM-LS64H
E3ZM-LS81H
E3ZM-LS82H
E3ZM-LS84H



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

BGS Reflective Models
Standard Connector
E3ZM-LS66H
E3ZM-LS67H
E3ZM-LS69H
E3ZM-LS86H
E3ZM-LS87H
E3ZM-LS89H



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

General Precautions

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

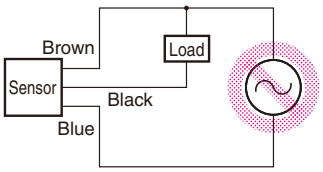
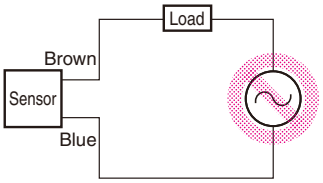
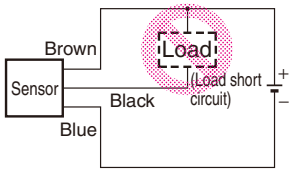
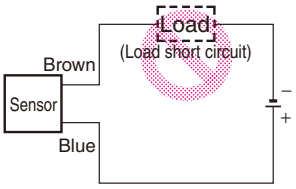
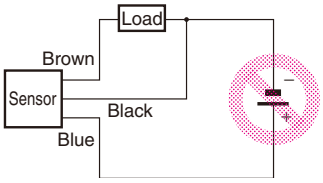
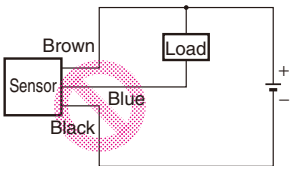
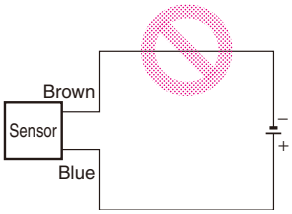
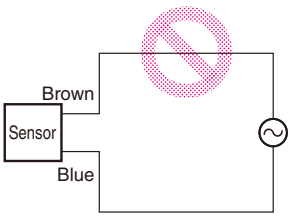
⚠ WARNING

These products cannot be used in safety devices for presses or other safety devices used to protect human life.
These products 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 Considerations

Item	Typical examples	
Power Supply Voltage Do not use a voltage that exceeds the operating voltage range. Applying a voltage that is higher than the operating voltage range, or using an AC power supply (100 VAC or higher) for a Sensor that requires a DC power supply may cause explosion or burning.	DC 3-Wire NPN Output Sensors 	DC 2-Wire Sensors 
Load short-circuiting • Do not short-circuit the load. Explosion or burning may result. • The load short-circuit protection function operates when the power supply is connected with the correct polarity and the power is within the rated voltage range.	DC 3-Wire NPN Output Sensors 	• DC 2-Wire Sensors • Even with the load short-circuit protection function, protection will not be provided when a load short circuit occurs if the power supply polarity is not correct. 
Incorrect Wiring Be sure that the power supply polarity and other wiring is correct. Incorrect wiring may cause explosion or burning.	DC 3-Wire NPN Output Sensors 	
Connection without a Load If the power supply is connected directly without a load, the internal elements may explode or burn. Be sure to insert a load when connecting the power supply.	• DC 2-Wire Sensors • Even with the load short-circuit protection function, protection will not be provided if both the power supply polarity is incorrect and no load is connected. 	AC 2-Wire Sensors 

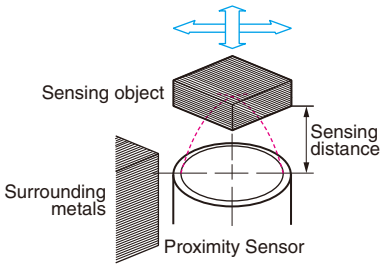
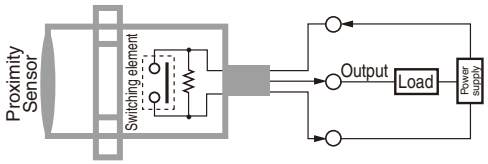
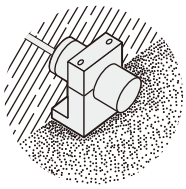
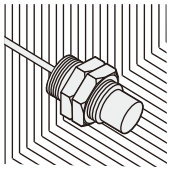
●Operating Environment

Do not use the Sensor in an environment where there are explosive or combustible gases.

Precautions for Correct Use

The following conditions must be considered to understand the conditions of the application and location as well as the relation to control equipment.

●Model Selection

Item	Points of consideration
Sensing object and operating condition of Proximity Sensor	Check the relation between the sensing object and the Proximity Sensor.  Specific conditions of object → Material, size, shape, existence of plating, etc. Direction of object movement → Transit interval, speed, existence of vibration, etc. Peripheral metal → Material, distance to Sensor, orientation, etc. Sensing distance → Fluctuation in transit point, allowable error, etc. Sensing (set) distance, shape of Sensor (rectangular, cylindrical, through-beam, grooved), influence of peripheral metal (Shielded Sensors, Non-shielded Sensors), response speed (response frequency), influence of temperature, influence of voltage, etc.
Electrical conditions	Verify the electrical conditions of the control system to be used and the electrical performance of the Proximity Sensor.  Power supply: DC (voltage fluctuation, current capacity value); AC (voltage fluctuation, frequency, etc.); Need for S3D2 Controller → Selecting the power supply type: DC / DC + S3D2 Controller / AC Load: Resistive load - Non-contact control system; Inductive load - Relay, solenoid, etc. • Steady-state current, inrush current • Operating, reset voltage (current); Lamp load • Steady-state current, inrush current; Open/close frequency → Selecting the power supply type: DC / DC + S3D2 Controller / AC; Control output Maximum current (voltage); Leakage current; Residual load voltage
Environmental conditions	 The environmental tolerance of the Proximity Sensor is better than that of other types of Sensors. However, investigate carefully before using a Proximity Sensor under harsh temperatures or in special atmospheres. Temperature and humidity — Highest or lowest values, existence of direct sunlight, etc. → Temperature influence, high-temperature use, low temperature use, need for shade, etc. Atmosphere — Water, oil, iron powder, or other special chemicals → Need for water resistance or oil resistance, need for explosion-proof structure Vibration and shock — Size, duration → Need for strength, mounting method • Water Resistance Do not use the Sensor in water, rain, or outdoors. • Ambient Conditions To maintain reliability of operation, do not use the Sensor outside the specified temperature range or outdoors. Even though the Proximity Sensor has a water-resistant structure, it must be covered to prevent direct contact with water or water-soluble cutting oil. Do not use the Sensor in atmospheres with chemical vapors, in particular, strong alkalis or acids (nitric acid, chromic acid, or hot concentrated sulfuric acid). • Explosive Atmospheres Do not use the Sensor in atmospheres where there is a danger of explosion. Use an Explosion-proof Sensor.
Mounting conditions	 When deciding the mounting method, take into consideration not only restrictions due to mechanical devices, but also ease of maintenance and inspection, and interference between Sensors. Wiring method, existence of inductance surges — Wires: Wire type, length, oil-resistant cable, shielded cable, robot cable, etc. Connection — Conduits, ducts, pre-wired, terminal wiring, ease of maintenance and inspection Mounting procedure — Existence of mounting brackets, direct mounting, secured with bolts or screws Installation location — Ease of maintenance and inspection, mounting space
Influence of external electromagnetic fields	• The influence within a DC magnetic field is 20 mT* max. Do not use the Sensor at a level higher than 20 mT. • Sudden changes in the DC magnetic field may cause malfunction. Do not use the Sensor for applications that involve turning a DC electromagnet ON and OFF. • Do not place a transceiver near the Sensor or its wiring. Doing so may cause malfunction.
Other considerations	Cost feasibility: Price/delivery time Life: Power-ON time/frequency of use

* mT (millitesla) is a unit for expressing magnetic flux density. One tesla is the equivalent of 10,000 gauss.

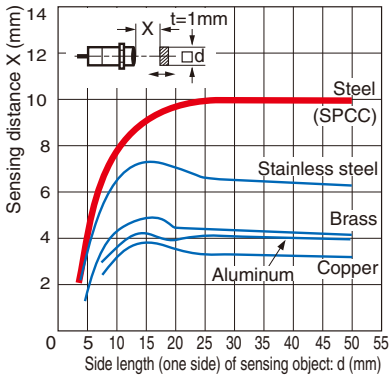
●Design

Sensing Object Material

The sensing distance varies greatly depending on the material of the sensing object. Study the engineering data for the influence of sensing object material and size and select a distance with sufficient leeway.

- In general, if the sensing object is a non-magnetic metal (for example, aluminum), the sensing distance decreases.

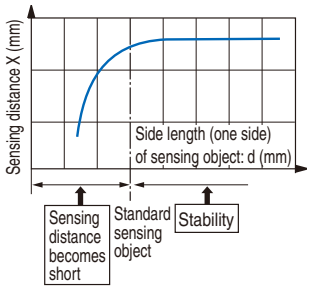
Example: E2-X10D□



Size of Sensing Object

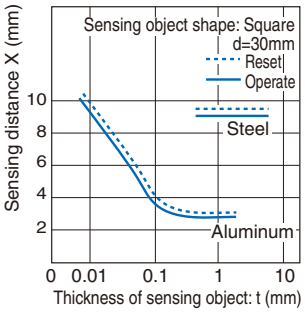
In general, if the object is smaller than the standard sensing object, the sensing distance decreases.

- Design the setup for an object size that is the same or greater than the standard sensing object size from the graphs showing the sensing object size and sensing distance.
- When the size of the standard sensing object is the same or less than the size of the standard sensing object, select a sensing distance with sufficient leeway.



Thickness of Sensing Object

- The thickness of ferrous metals (iron, nickel, etc.) must be 1 mm or greater.
- When the coating thickness is 0.01 mm or less, a sensing distance equivalent to a magnetic body can be obtained. When the coating is extremely thin and is not conductive, such as a vacuum deposited film, detection is not possible.



- Influence of Plating If the sensing object is plated, the sensing distance will change (see the table below).

Effect of Plating (Typical)
(Reference values: Percent of non-plated sensing distance)

Thickness and base material of plating	Steel	Brass
No plating	100	100
Zn 5 to 15 μm	90 to 120	95 to 105
Cd 5 to 15 μm	100 to 110	95 to 105
Ag 5 to 15 μm	60 to 90	85 to 100
Cu 10 to 20 μm	70 to 95	95 to 105
Cu 5 to 15 μm	-	95 to 105
Cu (5 to 10 μm) + Ni (10 to 20 μm)	70 to 95	-
Cu (5 to 10 μm) + Ni (10 μm) + Cr (0.3 μm)	75 to 95	-

Mutual Interference

- Mutual interference refers to a state where a Sensor is affected by magnetism (or static capacitance) from an adjacent Sensor and the output is unstable.
- One means of avoiding interference when mounting Proximity Sensors close together is to alternate Sensors with different frequencies. The model tables indicate whether different frequencies are available. Please refer to the tables.
- When Proximity Sensors with the same frequency are mounted together in a line or face-to-face, they must be separated by a minimum distance. For details, refer to *Mutual Interference* in the *Safety Precautions* for individual Sensors.

Power Reset Time

A Sensor is ready for detection within 100 ms after turning ON the power. If the load and Sensor are connected to separate power supplies, design the system so that the Sensor power turns ON first.

Turning OFF the Power

An output pulse may be generated when the power is turned OFF, so design the system so that the load or load line power turns OFF first.

Influence of Surrounding Metal

The existence of a metal object other than the sensing object near the sensing surface of the Proximity Sensor will affect detection performance, increase the apparent operating distance, degrade temperature characteristics, and cause reset failures. For details, refer to the influence of surrounding metal table in *Safety Precautions* for individual Sensors.
The values in the table are for the nuts provided with the Sensors. Changing the nut material will change the influence of the surrounding metal.

Power Transformers

Be sure to use an insulated transformer for a DC power supply. Do not use an auto-transformer (single-coil transformer).

Precautions for AC 2-Wire/DC 2-Wire Sensors

Surge Protection

Although the Proximity Sensor has a surge absorption circuit, if there is a device (motor, welder, etc.) that causes large surges near the Proximity Sensor, insert a surge absorber near the source of the surges.

Influence of Leakage Current

Even when the Proximity Sensor is OFF, a small amount of current runs through the circuit as leakage current.
For this reason, a small current may remain in the load (residual voltage in the load) and cause load reset failures. Verify that this voltage is lower than the load reset voltage (the leakage current is less than the load reset current) before using the Sensor.

Using an Electronic Device as the Load for an AC 2-Wire Sensor

When using an electronic device, such as a Timer, some types of devices use AC half-wave rectification. When a Proximity Sensor is connected to a device using AC half-wave rectification, only AC half-wave power will be supplied to the Sensor. This will cause the Sensor operation to be unstable. Also, do not use a Proximity Sensor to turn the power supply ON and OFF for electronic devices that use DC half-wave rectification. In such a case, use a relay to turn the power supply ON and OFF, and check the system for operating stability after connecting it.

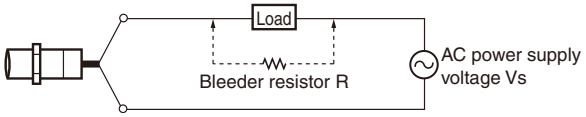
Examples of Timers that Use AC Half-wave Rectification
Timers: H3Y, H3YN, H3RN, H3CA-8, RD2P, and H3CR (-A, -A8, -AP, -F, -G)

Countermeasures for Leakage Current (Examples)

AC 2-Wire Sensors

Connect a bleeder resistor to bypass the leakage current flowing in the load so that the current flowing through the load is less than the load reset current.

> When using an AC 2-Wire Sensor, connect a bleeder resistor so that the Proximity Sensor current is at least 10 mA, and the residual load voltage when the Proximity Sensor is OFF is less than the load reset voltage.



Calculate the bleeder resistance and allowable power using the following equation.

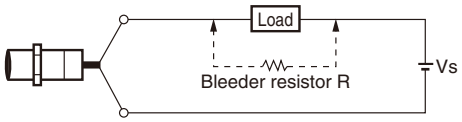
$$R \leq \frac{Vs}{10 - I}\ (k\Omega) \qquad P > \frac{Vs^2}{R}\ (mW)$$

P : Watts of bleeder resistance (the actual number of watts used should be several times this number)
I : Load current (mA)

It is recommend that leeway be included in the actual values used. For 100 VAC, use 10 kΩ or less and 3 W (5 W) or higher, and for 200 VAC, use 20 kΩ or less and 10 W (20 W) or higher. If the effects of heat generation are a problem, use the number of watts in parentheses ( ) or higher.

DC 2-Wire Sensors

Connect a bleeder resistor to bypass the leakage current flowing in the load, and design the load current so that (leakage current) × (load input impedance) < reset voltage.



Calculate the bleeder resistance and allowable power using the following equation.

$$R \leq \frac{Vs}{i_R - i_{OFFR}}\ (k\Omega) \qquad P > \frac{Vs^2}{R}\ (mW)$$

P : Watts of bleeder resistance (the actual number of watts used should be several times this number)
i_R : Leakage current of Proximity Sensor (mA)
i_{OFF} : Load reset current (mA)

It is recommend that leeway be included in the actual values used. For 12 VDC, use 15 kΩ or less and 450 mW or higher, and for 24 VDC, use 30 kΩ or less and 0.1 W or higher.

Loads with Large Inrush Current

Loads, such as lamps or motors, that cause a large inrush current* will weaken or damage the switching element. In this situation, use a relay.

* E2K, TL-N□Y: 1 A or higher

●Mounting

Mounting the Sensor

When mounting a Sensor, do not tap it with a hammer or otherwise subject it to excessive shock. This will weaken water resistance and may damage the Sensor. If the Sensor is being secured with bolts, observe the allowable tightening torque. Some models require the use of toothed washers.

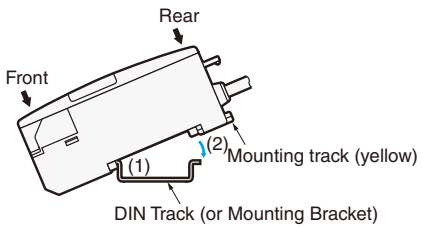
For details, refer to the mounting precautions in *Precautions for Correct Use* in individual product information.

Mounting/Removing Using DIN Track (Example for E2CY)

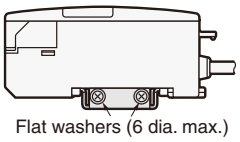
<Mounting>

(1) Insert the front of the Sensor into the special Mounting Bracket (included) or DIN Track.

(2) Press the rear of the Sensor into the special Mounting Bracket or DIN Track.

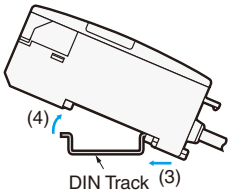


- When mounting the side of the Sensor using the special Mounting Bracket, first secure the Amplifier Unit to the special Mounting Bracket, and then mount the special Mounting Bracket with M3 screws and flat washers with a diameter of 6 mm maximum.



<Removing>

- While pressing the Amplifier Unit in the direction of (3), lift the fiber plug in the direction of (4) for easy removal without a screwdriver.

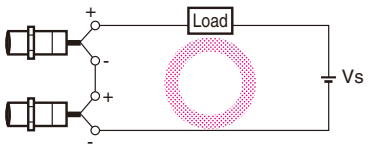
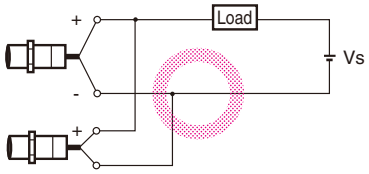
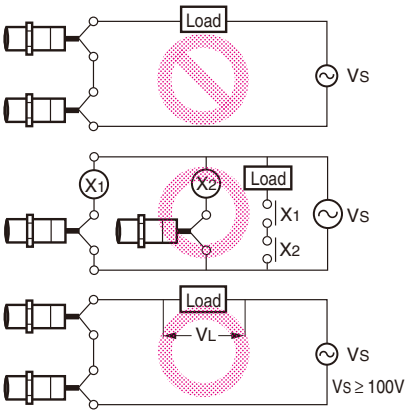
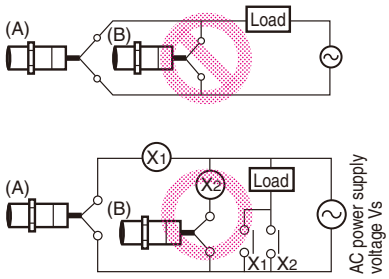


Set Distance

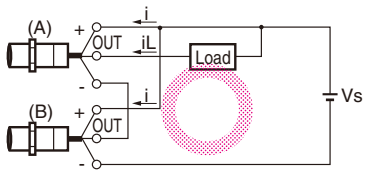
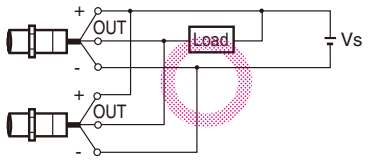
The sensing distance may vary due to fluctuations in temperature and voltage. When mounting the Sensor, it is recommend that installation be based on the set distance.

●Wiring Considerations

AND/OR Connections for Proximity Sensors

Model	Type of connection	Connection	Description
DC 2-Wire	AND (series connection)		Keep the number of connected Sensors (N) within the range of the following equation. $V_S - N \times V_R \geq$ Operating load voltage (N : Number of Sensors that can be connected V_R: Residual output voltage of Proximity Sensor V_S: Power voltage) It is possible, however, that the indicators may not light correctly and error pulses (of approximately 1 ms) may be generated because the rated power supply voltage and current are not supplied to individual Proximity Sensors. Verify that this is not a problem before operation.
	OR (parallel connection)		Keep the number of connected Sensors (N) within the range of the following equation. $N \times i \leq$ Load reset current (N: Number of Sensors that can be connected i: Leakage current of Proximity Sensor) Example: When an MY (24-VDC) Relay is used as the load, the maximum number of Sensors that can be connected is 4.
AC 2-wire	AND (series connection)		<TL-NY, TL-MY, E2K-□MY□, TL-T□Y> The above Proximity Sensors cannot be used in a sereis connection. If needed, connect through relays. <E2E-X□Y> For the above Proximity Sensors, the voltage VL that can be applied to the load when ON is $V_L = V_S$ - (Output residual voltage × Number of Sensors), for both 100 VAC and 200 VAC. The load will not operate unless V_L is higher than the load operating voltage. This must be verified before use. When using two or more Sensors in series with an AND circuit, the limit is three Sensors. (Be careful of the VS value in the diagram at left.)
	OR (parallel connection)		In general it is not possible to use two or more Proximity Sensors in parallel with an OR circuit. A parallel connection can be used if A and B will not be operated simultaneously and there is no need to hold the load. The leakage current, however, will be n times the value for each Sensor and reset failures will frequently occur. ("n" is the number of Proximity Sensors.) If A and B will be operated simultaneously and the load is held, a parallel connection is not possible. If A and B operate simultaneously and the load is held, the voltages of both A and B will fall to about 10 V when A turns ON, and the load current will flow through A causing random operation. When the sensing object approaches B, the voltage of both terminals of B is too low at 10 V and the switching element of B will not operate. When A turns OFF again, the voltages of both A and B rise to the power supply voltage and B is finally able to turn ON. During this period, there are times when A and B both turn OFF (approximately 10 ms) and the loads are momentarily restored. In cases where the load is to be held in this way, use a relay as shown in the diagram at left.

Note: When AND/OR connections are used with Proximity Sensors, the effects of erroneous pulses or leakage current may prevent use. Verify that there are no problems before use.

Model	Type of connection	Connection	Description
DC 3-wire	AND (series connection)		Keep the number of connected Sensors (N) within the range of the following equation. iL + (N - 1) × i ≤ Upper limit of Proximity Sensor control output Vs - N × VR ≥ Operating load voltage N : Number of Sensors that can be connected VR: Residual output voltage of Sensor Vs: Power supply voltage i : Current consumption of Sensor iL: Load current Example: A maximum of two Sensors can be used when an MY (24-VDC) Relay is used for the load. Note: When an AND circuit is connected, the operation of Proximity Sensor B causes power to be supplied to Proximity Sensor A, and thus erroneous pulses (approximately 1 ms) may be generated in A when the power is turned ON. For this reason, take care when the load has a high response speed because malfunction may result.
	OR (parallel connection)		For Sensors with a current output, a minimum of three OR connections is possible. Whether or not four or more connections is possible depends on the model.

Note: When AND/OR connections are used with Proximity Sensors, the effects of erroneous pulses or leakage current may prevent use. Verify that there are no problems before use.

Extending Cable Length

The cable of a Built-in Amplifier Sensor can be extended to a maximum length of 200 m with each of the standard cables (excluding some models).
For Separate Amplifier Sensors (E2C-EDA, E2C, E2J, E2CY), refer to the specific precautions for individual products.

Bending the Cable

If you need to bend the cable, we recommend a bend radius that is at least 3 times the outer diameter of the cable (with the exception of coaxial and shielded cables).

Cable Tensile Strength

In general, 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 min.	50 N max.

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

Separating High-voltage Lines

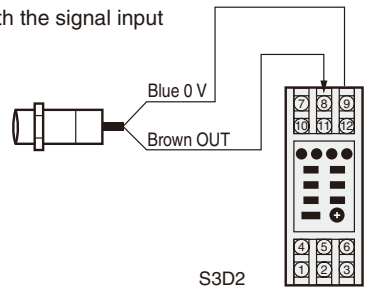
Using Metal Conduits
If a power line is to be located near the Proximity Sensor cable, use a separate metal conduit to prevent malfunction or damage. (Same for DC models.)

Example of Connection with S3D2 Sensor Controller

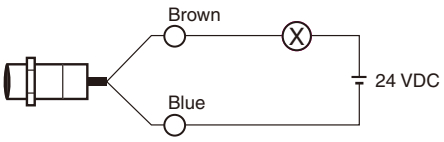
DC 2-Wire Sensors

Using the S3D2 Sensor Controller

Operation can be reversed with the signal input switch on the S3D2.



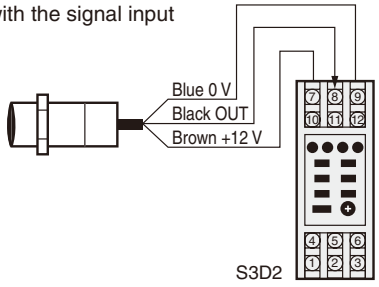
Connecting to a Relay Load



Note: DC 2-Wire Sensors have a residual voltage of 3 V. Check the operating voltage of the relay before use.
The residual voltage of the E2E-XD-M1J-T is 5 V.

DC 3-Wire Sensors

Operation can be reversed with the signal input switch on the S3D2.



●Operating Environment

Water Resistance

Do not use the Sensor in water, rain, or outdoors.

Ambient Conditions

Do not use the Sensor in the following environments.
Doing so may cause malfunction or failure of the Sensor.

1. To maintain operational reliability and service life, use the Sensor only within the specified temperature range and do not use it outdoors.
2. The Sensor has a water resistant structure, however, attaching a cover to prevent direct contact with water will help improve reliability and prolong product life.
3. Avoid using the Sensor where there are chemical vapors, especially strong alkalis or acids (nitric acid, chromic acid, or hot concentrated sulfuric acid).

●Maintenance and inspection

Periodic Inspection

To ensure long-term stable operation of the Proximity Sensor, inspect for the following on a regular basis. Conduct these inspections also for control devices.

1. Shifting, loosening, or deformation of the sensing object and Proximity Sensor mounting
2. Loosening, bad contact, or wire breakage in the wiring and connections
3. Adherence or accumulation of metal powder
4. Abnormal operating temperature or ambient conditions
5. Abnormal indicator flashing (on setting indicator types)

Disassembly and Repair

Do not under any circumstances attempt to disassemble or repair the product.

Quick Failure Check

You can conveniently check for failures by connecting the E39-VA Handy Checker to check the operation of 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.

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