

E3JM/E3JK

Two Models Contribute to Overall Cost Reduction

E3JM Terminal Block Models

- Easy to wire and adjust.

E3JK Pre-wired Models

- Slim body is economically priced and full of functions.



Be sure to read *Safety Precautions* on page 10.

Ordering Information

Sensors (Refer to *Dimensions* on page 12.)

E3JM

Red light Infrared light

Sensing method	Appearance	Connection method	Sensing distance	Operation mode	Output configuration	Functions	Model
Through-beam (Emitter + Receiver) *		Terminal block		Light-ON Dark-ON (switch selectable)	Relay	---	E3JM-10M4
					DC SSR		E3JM-10M4T
Retro-reflective with MSR function	 E39-R1 (provided)	Terminal block		Light-ON Dark-ON (switch selectable)	Relay	---	E3JM-10S4
					DC SSR		E3JM-10S4T
Diffuse-reflective		Terminal block		Light-ON Dark-ON (switch selectable)	Relay	---	E3JM-R4M4
					DC SSR		E3JM-R4M4T
Diffuse-reflective		Terminal block		Light-ON Dark-ON (switch selectable)	Relay	---	E3JM-R4S4
						DC SSR	
Diffuse-reflective		Terminal block		Light-ON Dark-ON (switch selectable)	Relay	---	E3JM-DS70M4
						DC SSR	
Diffuse-reflective		Terminal block		Light-ON Dark-ON (switch selectable)	Relay	---	E3JM-DS70S4
						DC SSR	

* The model number of the Emitter is E3JM-10L for all models. In order from the top the model numbers of the Receivers are E3JM-10DM4, E3JM-10DM4T, E3JM-10DS4, and E3JM-10DS4T. Orders for individual Emitters and Receivers are accepted.

E3JK

Sensing method	Appearance	Connection method	Sensing distance	Operation mode	Output configuration	Model
Through-beam (Emitter + Receiver) *1		Pre-wired (2 m)		Light-ON	Relay	E3JK-5M1 2M
				Dark-ON		E3JK-5M2 2M
Retro-reflective with MSR function		Pre-wired (2 m)		Light-ON	Both selectable	DC SSR
				Dark-ON		
Retro-reflective without MSR function	 E39-R1 (provided)	Pre-wired (2 m)		Light-ON	Both selectable	Relay
				Dark-ON		
Retro-reflective without MSR function	 E39-R1 (provided)	Pre-wired (2 m)		Light-ON	Both selectable	DC SSR
				Dark-ON		
Diffuse-reflective		Pre-wired (2 m)		Light-ON	Both selectable	Relay
				Dark-ON		
Diffuse-reflective		Pre-wired (2 m)		Light-ON	Both selectable	DC SSR
				Dark-ON		
Diffuse-reflective		Pre-wired (2 m)		Light-ON	Both selectable	Relay
				Dark-ON		
Diffuse-reflective		Pre-wired (2 m)		Light-ON	Both selectable	DC SSR
				Dark-ON		
Diffuse-reflective		Pre-wired (2 m)		Light-ON	Both selectable	Relay
				Dark-ON		
Diffuse-reflective		Pre-wired (2 m)		Light-ON	Both selectable	DC SSR
				Dark-ON		
Diffuse-reflective		Pre-wired (2 m)		Light-ON	Both selectable	DC SSR
				Dark-ON		

Note: UL-listed models have the -US suffix. (Example: E3JM-10M4-US 2M). Tightening nuts, washers, and rubber bushings are not provided with these models.

Change: Shape of the E3JM conduit socket

Note, however, that DC-type E3JK SSR Output Models are not UL-listed.

*1. The model number of the Emitter is E3JK-5L 2M for all models. In order from the top of the model number of the Receivers are E3JK-5DM1 2M, E3JK-5DM2 2M, and E3JK-5DS3 2M. Orders for individual Emitters and Receivers are accepted.

*2. Values in parentheses indicate the sensing distance when using E39-R2 Reflectors.

Accessories (Order Separately)Slit (Refer to *Dimensions* on page 12.)

Slit width	Sensing distance	Minimum detectable object (typical)	Model	Quantity	Remarks
1 mm × 20 mm	E3JM-10□4(T)	1.2 m	E39-S39	1 Slit each for the Emitter and Receiver (2 Slits total)	(Seal-type long slit) Can be used with the E3JM-10□4(T) and E3JK-5□□ Through-beam Models.
	E3JK-5□□	0.7 m			

Reflectors (Refer to *Dimensions* on E39-L/F39-L/E39-S/E39-R.)

Name	Sensing distance (typical)	Model	Quantity	Remarks	
Reflectors	E3JM-R4□4(T)	4 m (rated value)	E39-R1	1	Provided with the E3JM-R4□4(T) Provided with the E3JK-R2□□ Provided with the E3JK-R4□□
	E3JK-R2□□	2.5 m (rated value)			
	E3JK-R4□□	4 m (rated value)			
	E3JK-R2□□	3 m	E39-R2	1	---
	E3JK-R4□□	5 m			
Small Reflectors	E3JM-R4□4(T)	3.5 m	E39-R3	1	---
	E3JK-R2□□	1 m (5 mm) *			
Tape Reflectors	E3JM-R4□4(T)	1 m (200 mm) *	E39-RS1	1	Enables MSR function.
	E3JK-R2□□	750 mm (200 mm) *			
	E3JM-R4□4(T)	1.6 m (200 mm) *	E39-RS2	1	
	E3JK-R2□□	1.2 m (200 mm) *			
	E3JM-R4□4(T)	2 m (200 mm) *	E39-RS3	1	
E3JK-R2□□	1.5 m (200 mm) *				

Note: 1. When using any reflector other than the provided one, use a sensing distance of approximately 0.7 times the typical value as a guide.

2. Refer to *Reflectors* on E39-L/F39-L/E39-S/E39-R for details.

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

Mounting Bracket (Refer to E39-L/F39-L/E39-S/E39-R)

Appearance	Model	Quantity	Remarks
	E39-L53	1	Provided with the E3JM.
	E39-L40	1	Provided with the E3JK.
	E39-L51	1	Mounting Bracket designed for changing from the E3A-M, E3A2, E3A3, OA-5, or OA-5N to the E3JM.

Note: 1. If a Through-beam Model is used, order two Mounting Brackets, one for the Emitter and one for the Receiver.

2. Refer to *Mounting Brackets* on E39-L/F39-L/E39-S/E39-R for details.

Ratings and Specifications

E3JM

Sensing method		Through-beam model	Retro-reflective model (with MSR function)	Diffuse-reflective model
Item	Model	E3JM-10□4(T)	E3JM-R4□4(T)	E3JM-DS70□4(T)
Sensing distance		10 m	4 m (When using E39-R1)	White paper (200 × 200 mm): 700 mm
Standard sensing object		Opaque: 14.8-mm dia. min.	Opaque: 75-mm dia. min.	---
Differential travel		---		20% max. of sensing distance
Directional angle		Both Emitter and Receiver 3° to 20°	1° to 5°	---
Light source (wavelength)		Infrared LED (950 nm)	Red LED (660 nm)	Infrared LED (950 nm)
Power supply voltage		12 to 240 VDC±10%, ripple (p-p): 10% max. 24 to 240 VAC±10%, 50/60 Hz		
Power consumption	DC	3 W max. (Emitter 1.5 W max. Receiver 1.5 W max.)	2 W max.	
	AC	3 W max. (Emitter 1.5 W max. Receiver 1.5 W max.)	2 W max.	
Control output		Relay output (E3JM-□□M4 (T) model): SPDT, 250 VAC, 3A (cosφ=1) max., 5 VDC, 10 mA min. DC SSR output (E3JM-□□S4 (T) model): 48 VDC, 100 mA max. (residual voltage: 2 V max.) Light-ON/Dark-ON selectable		
Life expectancy (relay output)	Mechanical	50,000,000 times min. (switching frequency: 18,000 times/h)		
	Electrical	100,000 times min. (switching frequency: 1,800 times/h)		
Response time	Relay output	(E3JM-□□M4 (T) models) Operate or reset: 30 ms max.		
	DC SSR output	(E3JM-□□S4 (T) models) Operate or reset: 5 ms max.		
Sensitivity adjustment		---		One-turn adjuster
Timer function *		ON-delay/OFF-delay/One-shot delay switch selectable Delay time: 0.1 to 5 s (adjustable), only for E3JM-□□□4T		
Ambient illumination (Receiver side)		Incandescent lamp: 3,000 lx max.		
Ambient temperature range		Operating: -25°C to 55°C, Storage: -30°C to 70°C (with no icing or condensation)		
Ambient humidity range		Operating: 45% to 85% (with no condensation), Storage: 35% to 95% (with no condensation)		
Insulation resistance		20 MΩ min. at 500 VDC		
Dielectric strength		2,000 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		
	Malfunction	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		
	Malfunction	100 m/s ² 3 times each in X, Y, and Z directions		
Degree of protection		IEC 60529: IP66		
Connection method		Terminal block		
Weight (packed state)		Approx. 270 g	Approx. 160 g	
Material	Case	ABS (Acrylonitril Butadiene Styrene)		
	Lens	Methacrylic resin		
	Cover	Polycarbonate		
	Mounting Bracket	Iron		
Accessories		Mounting Bracket (with screw), Nuts, Terminal Protection Cover, One set of cable connection nuts (excluding -US Models), Instruction manual, Reflector (E39-R1: only for Retro-reflective Sensors)		

* The timer cannot be disabled for models with timer functions (E3JM-□□□4T).

E3JK

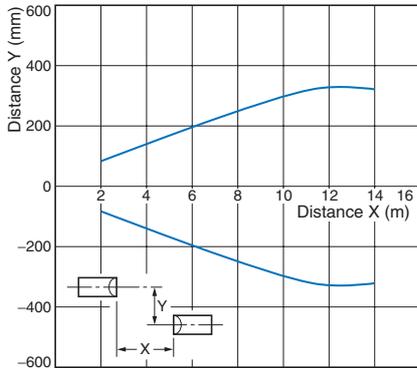
Sensing method		Through-beam model		Retro-reflective model (with MSR function)		Retro-reflective model (without MSR function)		Diffuse-reflective model	
Item	Model	E3JK -5M□	E3JK -5S3	E3JK -R2M□	E3JK -R2S3	E3JK -R4M□	E3JK -R4S3	E3JK -DS30M□	E3JK -DS30S3
Sensing distance		5 m		2.5 m (When using E39-R1)		4 m (When using E39-R1)		White paper (100 × 100 mm): 300 mm	
Standard sensing object		Opaque: 14.8-mm dia. min.		Opaque: 75-mm dia. min.				---	
Differential travel				---				20% max. of sensing distance	
Directional angle		Both Emitter and Receiver 3° to 20°		1° to 5°				---	
Light source (wavelength)		Infrared LED (950 nm)		Red LED (660 nm)				Infrared LED (950 nm)	
Power supply voltage		12 to 240 VDC±10%, ripple (p-p): 10% max. 24 to 240 VAC±10%, 50/60 Hz							
Power consumption	DC	3 W max. (Emitter 1.5 W max. Receiver 1.5 W max.)		2 W max.					
	AC	3 W max. (Emitter 1.5 W max. Receiver 1.5 W max.)		2 W max.					
Control output		Relay output SPDT, 250 VAC, 3 A max. (cosφ= 1) 5 VDC, 10 mA min.	DC SSR output, Negative: common 48 VDC, 100 mA max. Leakage current: 0.1 mA max. With load short-circuit protection	Relay output SPDT, 250 VAC, 3 A max. (cosφ= 1) 5 VDC, 10 mA min.	DC SSR output, Negative: common 48 VDC, 100 mA max. Leakage current: 0.1 mA max. With load short-circuit protection	Relay output SPDT, 250 VAC, 3 A max. (cosφ= 1) 5 VDC, 10 mA min.	DC SSR output, Negative: common 48 VDC, 100 mA max. Leakage current: 0.1 mA max. With load short-circuit protection	Relay output SPDT, 250 VAC, 3 A max. (cosφ= 1) 5 VDC, 10 mA min.	DC SSR output, Negative: common 48 VDC, 100 mA max. Leakage current: 0.1 mA max. With load short-circuit protection
Life expectancy (relay output)	Mechanical	50,000,000 times min. (switching frequency: 18,000 times/h)							
	Electrical	100,000 times min. (switching frequency: 1,800 times/h)							
Response time		30 ms max.	10 ms max.	30 ms max.	5 ms max.	30 ms max.	5 ms max.	30 ms max.	5 ms max.
Sensitivity adjustment		---							One-turn adjuster
Ambient illumination (Receiver side)		Incandescent lamp: 3,000 lx max.							
Ambient temperature range		Operating: -25°C to 55°C, Storage: -30°C to 70°C (with no icing or condensation)							
Ambient humidity range		Operating: 45% to 85% (with no condensation), Storage: 35% to 95% (with no condensation)							
Insulation resistance		20 MΩ min. at 500 VDC							
Dielectric strength		1,500 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							
	Malfunction	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							
	Malfunction	100 m/s ² 3 times each in X, Y, and Z directions	500 m/s ² 3 times each in X, Y, and Z directions	100 m/s ² 3 times each in X, Y, and Z directions	500 m/s ² 3 times each in X, Y, and Z directions	100 m/s ² 3 times each in X, Y, and Z directions	500 m/s ² 3 times each in X, Y, and Z directions	100 m/s ² 3 times each in X, Y, and Z directions	500 m/s ² 3 times each in X, Y, and Z directions
Degree of protection		IEC 60529 IP64							
Connection method		Pre-wired (standard length: 2 m)							
Weight (packed state)		Approx. 420 g		Approx. 250 g					
Material	Case	ABS (Acrylonitril Butadiene Styrene)							
	Lens	Methacrylic resin							
	Mounting Bracket	Iron							
Accessories		Mounting Bracket (with screws), Nuts, Instruction manual, Reflector (Retro-reflective Models only)							

Engineering Data (Typical)

Parallel Operating Range

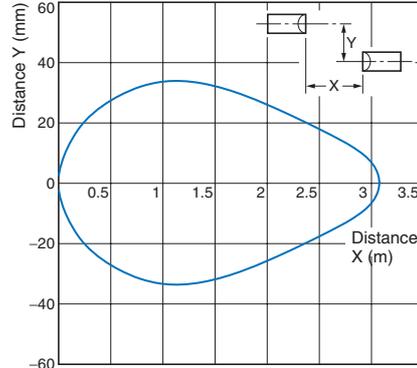
Through-beam

E3JM-10□4(T)



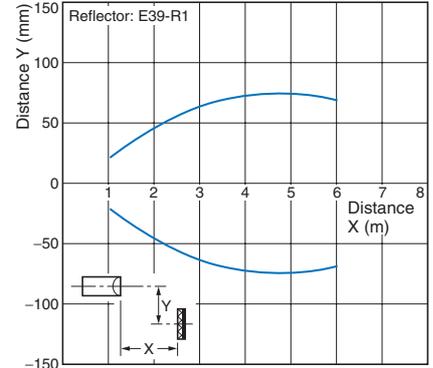
Through-beam

E3JM-10□4(T) + E39-S39
(Optional Slit)



Retro-reflective

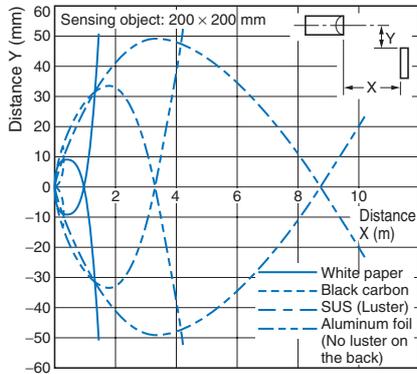
E3JM-R4□4(T) + E39-R1
(Supplied Reflector)



Operating Range

Diffuse-reflective

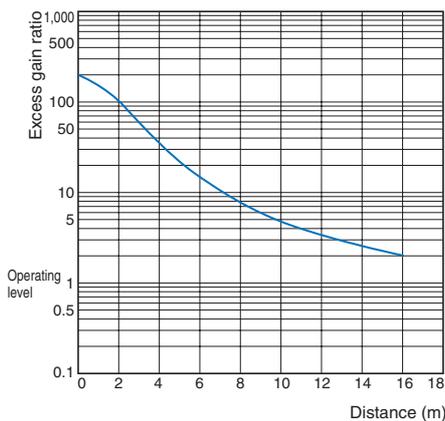
E3JM-DS70□4(T)



Excess Gain Ratio vs. Set Distance

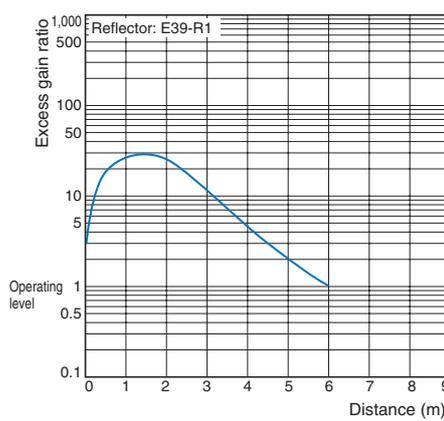
Through-beam

E3JM-10□4(T)

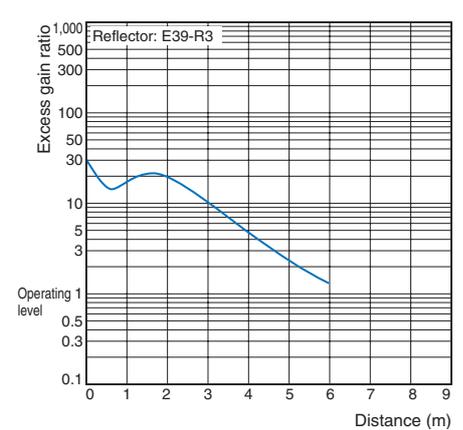


Retro-reflective

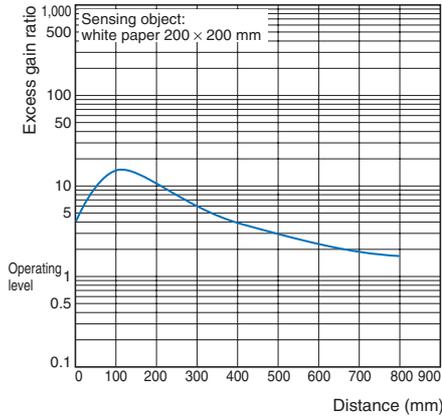
E3JM-R4□4(T) + E39-R1
(Supplied Reflector)



E3JM-R4□4(T) + E39-R3
(Optional Reflector)

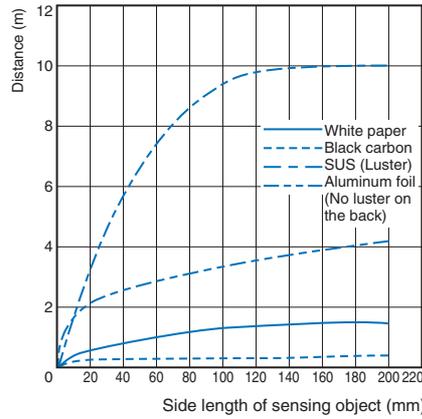


Diffuse-reflective
E3JM-DS70□4(T)



Sensing Object Size vs. Sensing Distance

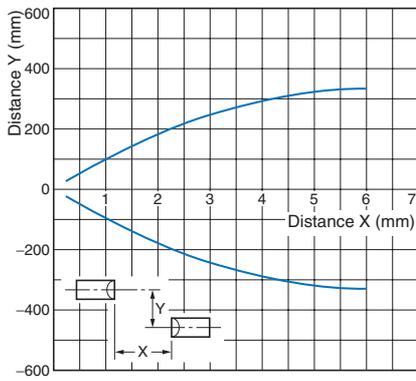
E3JM-DS70□4(T)



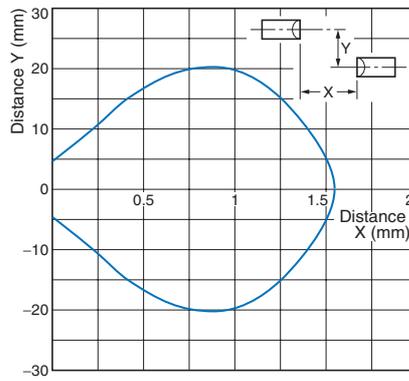
Parallel Operating Range

Through-beam

E3JK-5□□

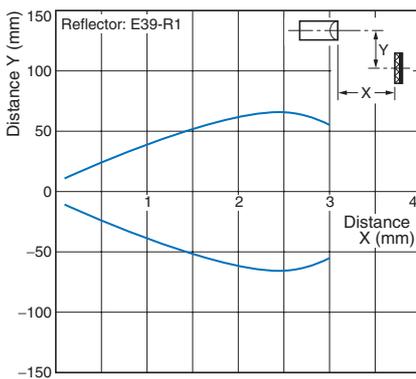


E3JK-5□□ + E39-S39 (Optional Slit)

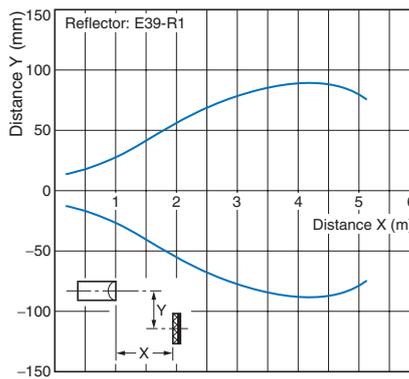


Retro-reflective

E3JK-R2□□ + E39-R1
(Supplied Reflector)



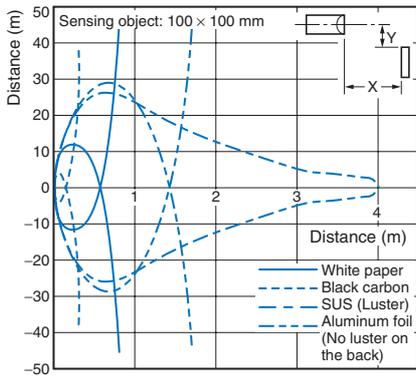
E3JK-R4□□ + E39-R1
(Supplied Reflector)



Operating Range

Diffuse-reflective

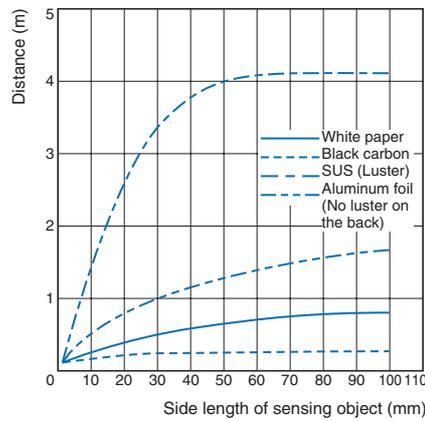
E3JK-DS30□□



Sensing Object Size vs. Sensing Distance

Diffuse-reflective

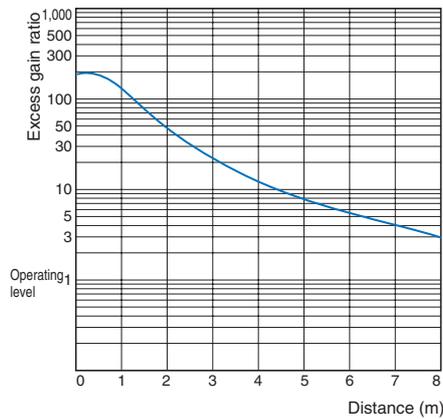
E3JK-DS30□□



Excess Gain Ratio vs. Set Distance

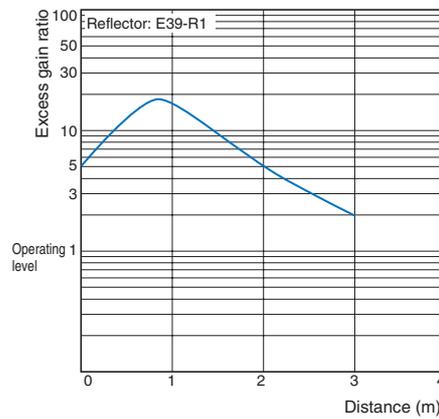
Through-beam

E3JK-5□□

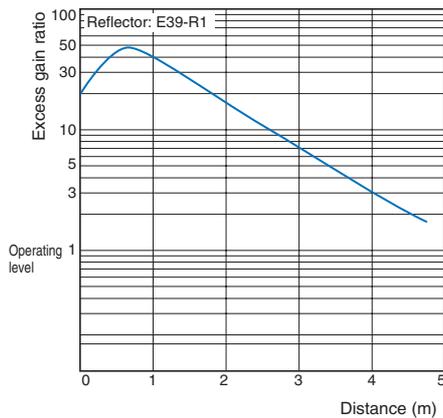


Retro-reflective

E3JK-R2□□ + E39-R1 (Supplied Reflector)

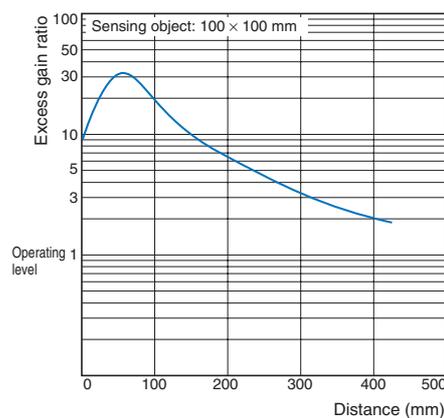


E3JK-R4□□ + E39-R1 (Supplied Reflector)



Diffuse-reflective

E3JK-DS30□□



I/O Circuit Diagrams

E3JM

Relay Output Models

Model	Timing chart	Output circuit
E3JM-10M4(T) E3JM-R4M4(T) E3JM-DS70M4(T)	<p>Incident light No incident light Light indicator (red) ON OFF L-ON (Ta) ON OFF D-ON (Ta) ON OFF</p>	<p>24 to 240 VAC 12 to 240 VDC Power Source No polarity Photoelectric Sensor main circuit 3 Tb 4 Tc 5 Ta Contact output (Built-in Relay: G6C)</p>

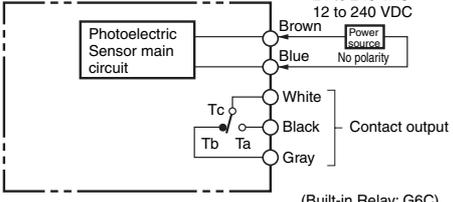
DC SSR Output Models

Model	Timing chart	Output circuit
E3JM-10S4(T) E3JM-R4S4(T) E3JM-DS70S4(T)	<p>Incident light No incident light Light indicator (red) ON OFF L-ON (Ta) ON OFF D-ON (Ta) ON OFF</p>	<p>24 to 240 VAC 12 to 240 VDC Power Source No polarity Photoelectric Sensor main circuit Drive Circuit L/ON NO Load I1 D/ON NC Load I2 48 VDC max. COM $I_1 + I_2 < 100 \text{ mA}$</p>

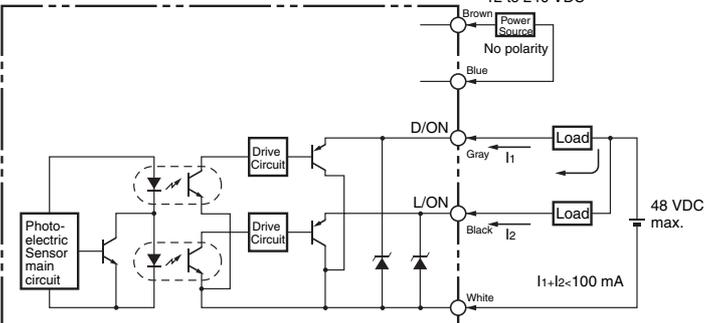
Note: Connect terminal 1 to any polarity and terminal 2 to the power supply because there is no polarity on the Emitter side.

E3JK

Relay Output Models

Model	Timing chart	Output circuit
E3JK-5M1 E3JK-5M2	<p>Incident light </p> <p>No incident light </p> <p>Light indicator (red) ON </p> <p> OFF </p> <p>L-ON (Ta) ON </p> <p>E3JK-R2M1 OFF </p> <p>E3JK-R2M2 OFF </p> <p>E3JK-R4M1 OFF </p> <p>E3JK-R4M2 OFF </p> <p>D-ON (Ta) ON </p> <p>E3JK-DS30M1 OFF </p> <p>E3JK-DS30M2 OFF </p>	 <p>(Built-in Relay: G6C)</p>

DC SSR Output Models

Model	Timing chart	Output circuit
E3JK-5S3 E3JK-R2S3 E3JK-R4S3 E3JK-DS30S3	<p>Incident light </p> <p>No incident light </p> <p>Light indicator (red) ON </p> <p> OFF </p> <p>L-ON output ON </p> <p> OFF </p> <p>D-ON output ON </p> <p> OFF </p>	 <p>Note: The output stage leakage currents are 0.1 mA max., respectively.</p>

Note: Connect the brown cable to any polarity and the blue cable to the power supply because there is no polarity on the Emitter side.

Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠ WARNING

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



Precautions for Correct Use

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

E3JM

● **Designing**

Operation

Note: The white part of the DIP switch indicates which setting is selected.

	Switch configuration	Switch selection	Timing charts
Models without timer	<p>MODE 0 ↔ 1</p> <p>D-ON L-ON</p> <p>Operation selector</p>	<p>MODE 0 ↔ 1</p> <p>D-ON L-ON ← Light-ON, Relay ON, DC output switching element ON</p> <p>MODE 0 ↔ 1</p> <p>D-ON L-ON ← Dark-ON, Relay ON, DC output switching element ON</p>	
Models with timer	<p>MODE 0 ↔ 1</p> <p>D-ON L-ON</p> <p>TIMER SW1 SW2</p> <p>Operation Selector</p> <p>Selector switch for timer mode</p>	<p>ON-delay</p> <p>MODE 0 ↔ 1</p> <p>D-ON L-ON</p> <p>TIMER SW1 SW2</p> <p>Both SW1 and SW2 at "0."</p> <p>OFF-delay</p> <p>MODE 0 ↔ 1</p> <p>D-ON L-ON</p> <p>TIMER SW1 SW2</p> <p>Only SW2 at "1."</p> <p>One-shot delay</p> <p>MODE 0 ↔ 1</p> <p>D-ON L-ON</p> <p>TIMER SW1 SW2</p> <p>Only SW1 at "1," which overrides either setting of SW2.</p> <p>Note: The operation selector is the same as that for models without a timer.</p>	<p>ON-delay</p> <p>OFF-delay</p> <p>One-shot delay</p>

Output Relay Contact

If E3JM/E3JK is connected to a load with contacts that spark when the load is turned OFF (e.g., a contactor or valve), the normally-closed side may be turned ON before the normally-open side is turned OFF or vice-versa. If both normally-open output and normally-closed output are used simultaneously, apply a surge suppressor to the load.

Refer to *OMRON's PCB Relays Catalog (X33)* for typical examples of surge suppressors.

● Wiring

Connecting and Wiring

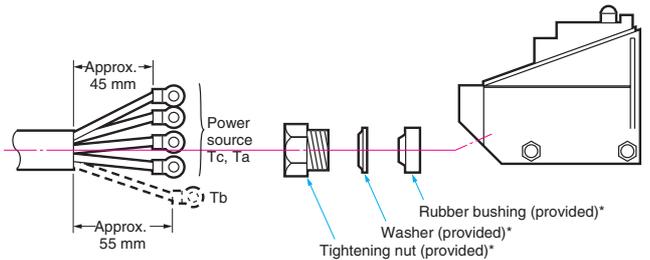
- Recommended outer diameter of cables is from 6 to 8 mm.
- Be sure to firmly tighten the cover in order to maintain waterproof and dustproof properties. The screw size of the conduit sockets is shown in the following table.

Model	Conduit socket thread size
E3JM-□	PF1/2

Cable End Treatment

Adjust the four wires to the same length when the Ta output is to be used only. If both the Ta and Tb outputs are to be used, treat them as shown in the following diagram.

Recommended example



* These parts are not provided with models with a -US suffix.

Recommended Crimp Terminal Dimensions (Unit: mm)

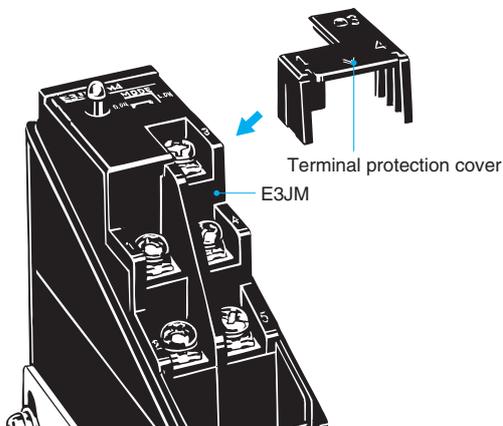
Round type	Fork type

Note: Use terminals with insulation tube (recommended crimp terminal: 1.25 to 3.5).

● Others

Terminal Protection Cover (Provided)

The terminal protection cover is designed to improve safety by maintaining the sensitivity properties of the product and by preventing any contact with charged sections while it is being operated with the mode set to the timer mode. Mount the product as shown in the following diagram (mount the Through-beam Model on the Receiver side).



E3JK

● Designing

Power Reset Time

The Sensor is ready to detect within 200 ms after it is turned ON. If the Sensor and load are connected to separate power supplies, be sure to turn ON the Sensor first.

Items Common to E3JM and E3JK

● Wiring

Connecting and Wiring DC SSR Output Models

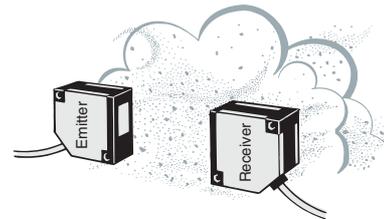
When using the DC SSR output model, the total of the load current for the Light-ON output (NO) and that for the Dark-ON (NC) should be 100 mA max. If the total exceeds 100 mA, the load short-circuit protection function will be activated (this function will be reset when the power of the Photoelectric Sensor is turned OFF).

● Others

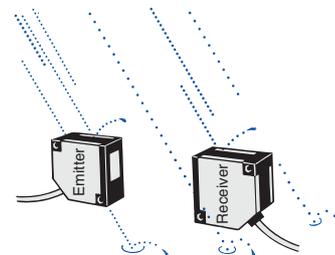
Ambient Conditions (Installation Area)

The E3JM will malfunction if installed in the following places.

- Places where the E3JM is exposed to a dusty environment.
- Places where corrosive gases are produced.



- Places where the E3JM is directly exposed to water, oil, or chemicals.



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2008.11

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