Long-distance Photoelectric Sensor with Built-in Amplifier

E3G

E278-E1-6-1

Line of Long-distance Photoelectric Sensors for Large Workpieces Includes Retro-reflective Models with Sensing Distance of 10 m and Distance Settings Up to 2 m.

- Compact Retro-reflective models require less wiring and less space with a sensing distance as long as 10 m.
- Distance-setting models feature a teaching function.
- Stability indicator shows at a glance when operating conditions are stable.
- Relay and selectable NPN/PNP transistor outputs provided.
- Cable, standard connector, and terminal board models available.

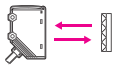
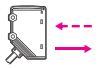
⚠ Be sure to read *Safety Precautions* on page 8.

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

Ordering Information

Sensors (Refer to *Dimensions* on page 10.)

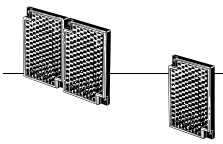
Red light Infrared light

Sensing method	Appearance	Connection method	Sensing distance	Timer function	Model	
					NPN/PNP selector	Relay output
Retro-reflective (with MSR function)	 E39-R2 (provided)	Pre-wired (2 m)	10 m (500 mm) *	---	**E3G-R13 2M**	---
		Connector (M12)			**E3G-R17**	
		Terminal block		---		**E3G-MR19**
				Yes		**E3G-MR19T**
Distance-setting		Pre-wired (2 m)	White paper (300 × 300 mm) 0.2 to 2 m	---	**E3G-L73 2M**	---
		Connector (M12)			**E3G-L77**	
		Terminal block		---		**E3G-ML79**
				Yes		**E3G-ML79T**

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

Accessories (Order Separately)

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

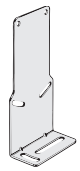
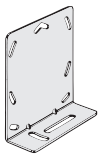
Appearance	Sensing distance		Model	Minimum order	Remarks
	Rated value	Reference value			
	10 m (500 mm) *	---	**E39-R2**	1	Provided with the E3G-R1□/MR19(T).
	---	6 m (100 mm)*	**E39-R1**	1	---

Note: If you use the Reflector at any distance other than the rated distance, make sure that the stability indicator lights properly when you install the Sensor.
* Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

Terminal Protection Cover for Side-pullout Cable (Refer to *Dimensions* on page 12.)

Appearance	Model	Minimum order	Applicable model	Remarks
	**E39-L129**	1	E3G-MR19(T) E3G-ML79(T)	Provided with rubber bushing and cap for pullout prevention in vertical direction.

Mounting Brackets (Refer to E39-L/E39-S/E39-R)

Appearance	Model	Quantity	Applicable model	Remarks
	**E39-L131**	1	E3G-R1□ E3G-L7□	---
	**E39-L132**	1		Rear-mounting use
	**E39-L135**	1	E3G-MR19(T) E3G-ML79(T)	Cable pulled out in the downward direction
	**E39-L136**	1		---

Note: Mounting Brackets are not provided with Sensors and must be purchased separately.

Sensor I/O Connectors (M12) (Sockets on One Cable End) (Refer to *Dimensions* on XS2.)

Cable	Appearance	Cable type		Model
Standard	Straight 	2 m	Three-conductor type	**XS2F-D421-DC0-F**
		5 m		**XS2F-D421-GC0-F**
	L-shaped 	2 m		**XS2F-D422-DC0-F**
		5 m		**XS2F-D422-GC0-F**

Note: Refer to *Introduction to Sensor I/O Connectors/Sensor Controllers* for details.

Ratings and Specifications

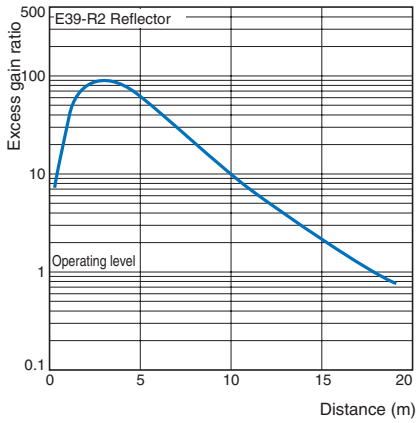
Sensing method		Retro-reflective (with MSR function)				Distance-setting			
Item	Model	E3G-R13	E3G-R17	E3G-MR19	E3G-MR19T	E3G-L73	E3G-L77	E3G-ML79	E3G-ML79T
Sensing distance		10 m (500 mm)*1 (when using E39-R2)				White paper (300 x 300 mm): 0.2 to 2 m			
Setting distance		---				White paper (300 x 300 mm): 0.5 to 2 m			
Standard sensing object		Opaque: 80-mm dia. min.				---			
Differential travel		---				10% of setting distance			
Directional angle		Sensor: 1° to 5°				---			
Reflectivity characteristics (black/white error)		---				±10% max. (at 1-m sensing distance)			
Light source (wavelength)		Red LED (650 nm)				Infrared LED (860 nm)			
Spot size		---				70 dia. max. (at 1-m sensing distance)			
Power supply voltage		10 to 30 VDC, ripple (p-p): 10%		12 to 240 VDC±10%, ripple (p-p): 10% max. 24 to 240 VAC±10% at 50/60 Hz		10 to 30 VDC, ripple (p-p): 10% (p-p)		12 to 240 VDC±10%, ripple (p-p): 10% max. 24 to 240 VAC±10% at 50/60 Hz	
Current/Power consumption		50 mA max.		2 W max.		60 mA max.		2 W max.	
Control output		Load power supply voltage: 30 VDC max. Load current: 100 mA max. Residual voltage: NPN output: 1.2 V max. PNP output: 2.0 V max. Open collector output (NPN/PNP selectable) L.ON/D.ON selectable		Relay output: SPDT, 3 A (cosϕ= 1) max. at 250 VAC or 3 A max. at 30 VDC L.ON/D.ON selectable		Load power supply voltage: 30 VDC max. Load current: 100 mA max. Residual voltage: NPN output: 1.2 V max. PNP output: 2.0 V max. Open collector output (NPN/PNP selectable) L.ON/D.ON selectable		Relay output: SPDT, 3 A (cosϕ= 1) max. at 250 VAC or 3 A max. at 30 VDC L.ON/D.ON selectable	
Life expectancy (relay output)	Mechanical	---		50,000,000 operations min. (switching frequency: 18,000 operations/h)		---		50,000,000 operations min. (switching frequency: 18,000 operations/h)	
	Electrical	---		100,000 operations min. (switching frequency: 1,800 operations/h)		---		100,000 operations min. (switching frequency: 1,800 operations/h)	
Protection circuits		Power supply reverse polarity protection, Output short-circuit protection, Mutual interference prevention		Mutual interference prevention		Power supply reverse polarity protection, Output short-circuit protection, Mutual interference prevention		Mutual interference prevention	
Response time		Operate or reset: 1 ms		Operate or reset: 30 ms max.		Operate or reset: 5 ms		Operate or reset: 30 ms max.	
Sensitivity adjustment		One-turn adjuster				Teaching (in NORMAL or ZONE mode)			
Timer function		---			ON- or OFF-delay: 0 to 5 s (adjustable)	---			ON- or OFF-delay: 0 to 5 s (adjustable)
Ambient illumination (Receiver side)		Incandescent lamp: 3,000 lx max. Sunlight: 10,000 lx max.							
Ambient temperature range		Operating: –25° to 55°C, Storage: –30° 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		2,000 VAC, 50/60 Hz for 1 min.		1,000 VAC, 50/60 Hz for 1 min		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							
Shock resistance		Destruction: 500 m/s² 3 times each in X, Y, and Z directions							
Degree of protection		IEC 60529 IP67 (with protective cover)							
Connection method		Pre-wired (Standard length: 2 m)	Connector (M12)	Terminal block		Pre-wired (Standard length: 2 m)	Connector (M12)	Terminal block	
Weight (packed state)		Approx. 150 g	Approx. 50 g	Approx. 150 g			Approx. 50 g	Approx. 150 g	
Material	Case	PBT (polybutylene terephthalate)							
	Lens	Mechacrylic resin							
Accessories *2		Reflector, Adjustment screwdriver, and Instruction manual				Adjustment screwdriver and Instruction manual			

*1. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.
*2. Mounting Brackets are sold separately.

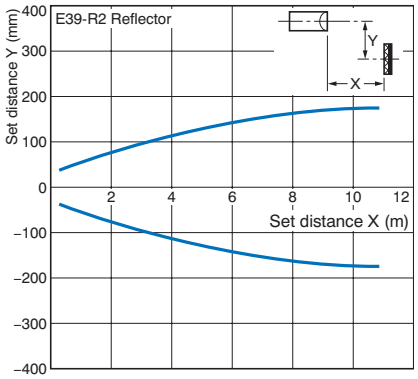
Engineering Data (Reference Value)

E3G-R/MR Retro-reflective Models

Excess Gain vs. Set Distance

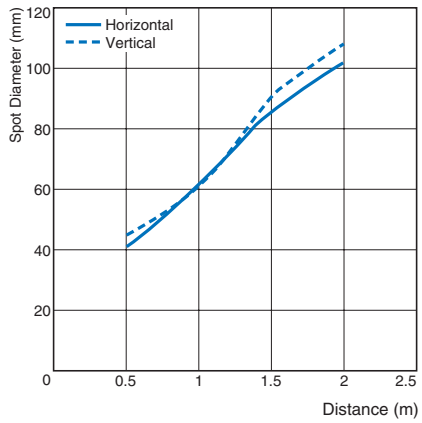


Parallel Operating Range

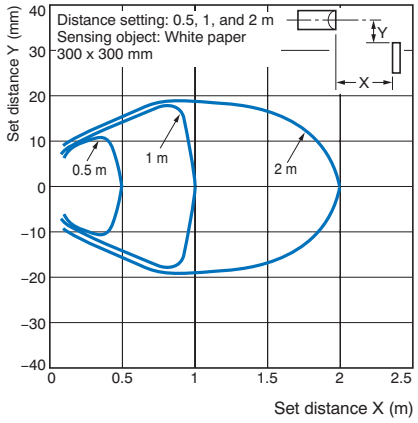


E3G-L/ML Distance-setting Models

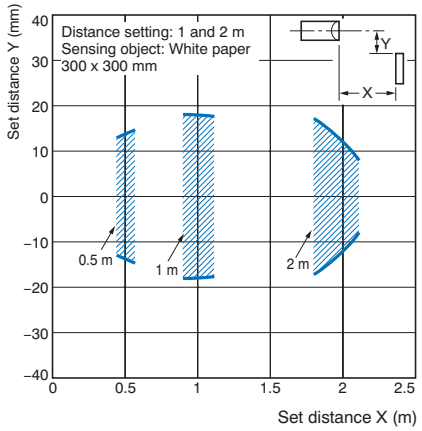
Spot Diameter vs. Sensing Distance



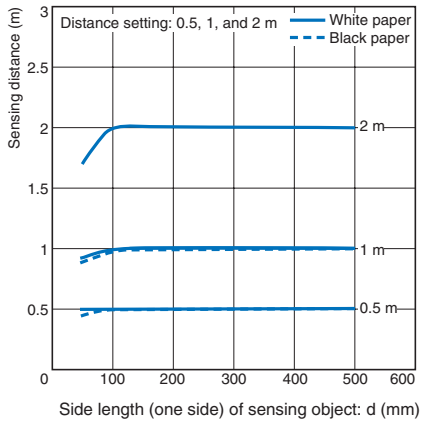
Operating Range in NORMAL Mode



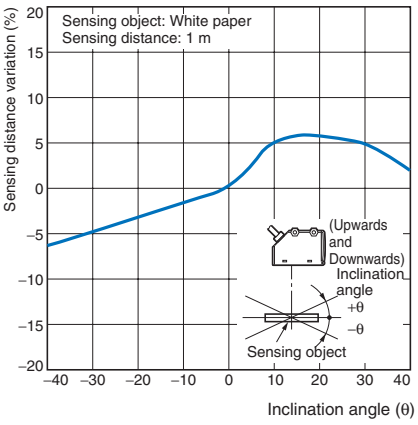
Operating Range in ZONE Mode



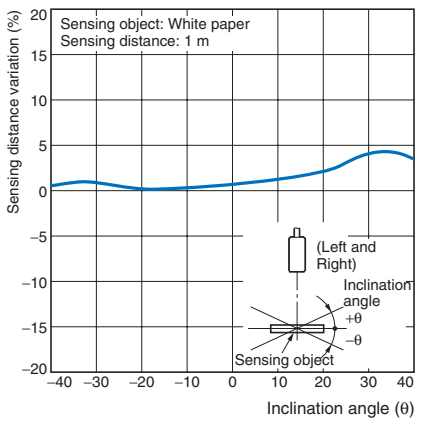
Sensing Object Size vs. Setting Distance



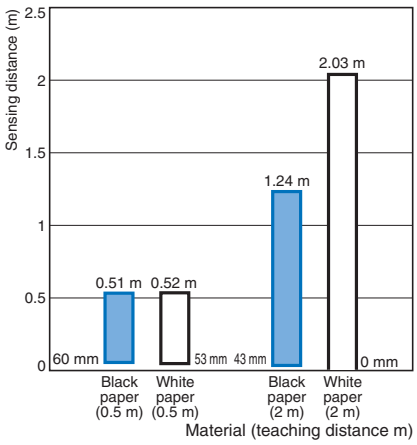
Sensing Object Angle Characteristics (Vertical)



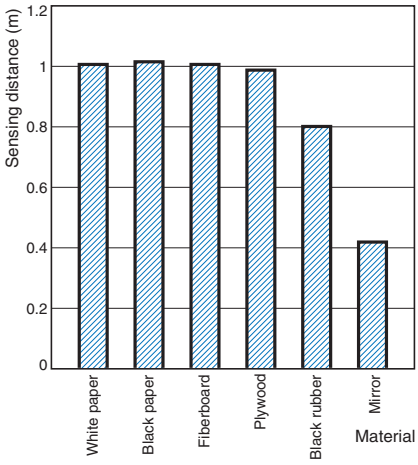
Sensing Object Angle (Horizontal)



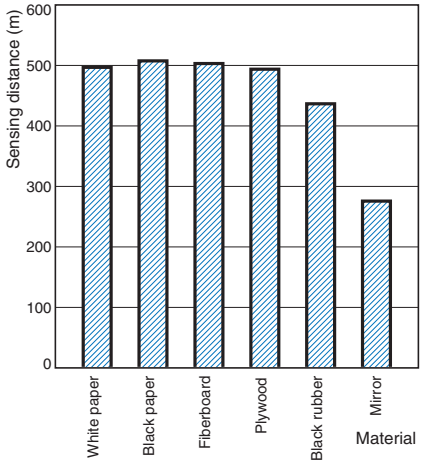
Close-range Characteristics



Sensing Distance vs. Sensing Object Material (at 1-m Setting Distance)

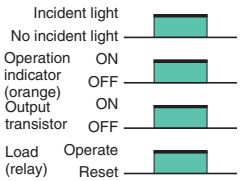
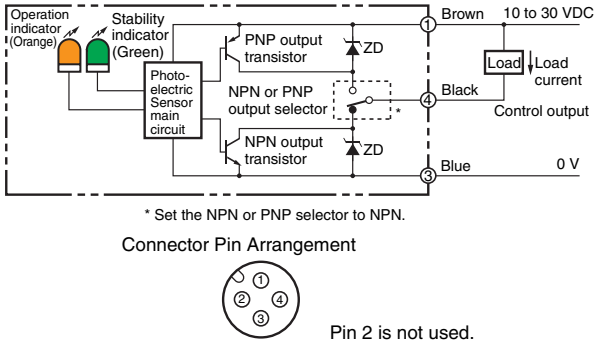
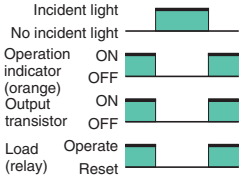


Sensing Distance vs. Sensing Object Material (at 500-mm Setting Distance)



I/O Circuit Diagrams

NPN Output

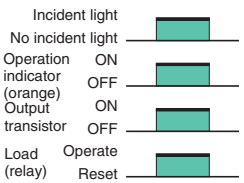
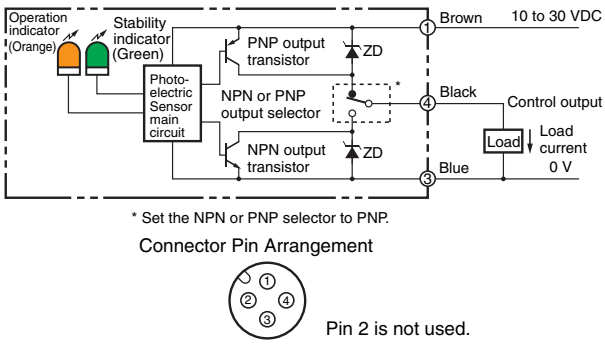
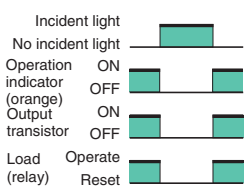
Model	Operation mode	Timing charts	Operation selector	Output circuit
E3G-R13 E3G-R17 E3G-L73 E3G-L77	Light-ON		L side (L-ON)	
	Dark-ON		D side (D-ON)	

* Set the NPN or PNP selector to NPN.

Connector Pin Arrangement

Pin 2 is not used.

PNP Output

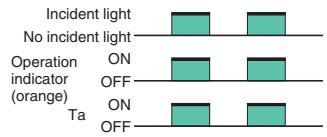
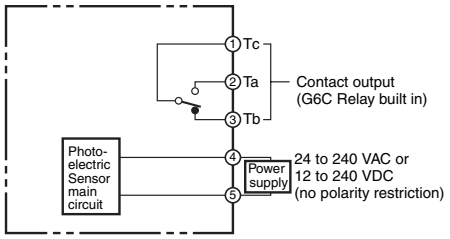
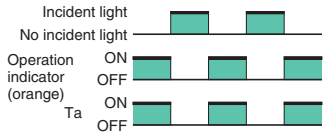
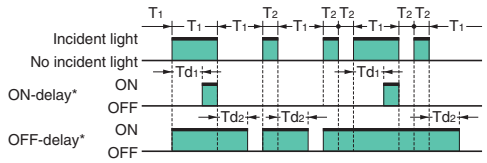
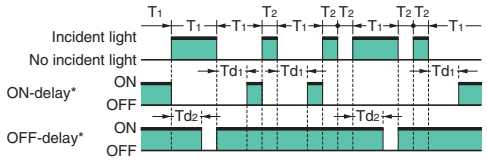
Model	Operation mode	Timing charts	Operation selector	Output circuit
E3G-R13 E3G-R17 E3G-L73 E3G-L77	Light-ON		L side (L-ON)	
	Dark-ON		D side (D-ON)	

* Set the NPN or PNP selector to PNP.

Connector Pin Arrangement

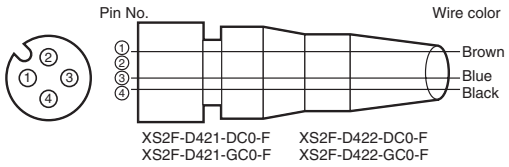
Pin 2 is not used.

Relay Output

Timer function	Model	Timing charts	Operation selector	Output circuit
None	E3G -MR19 E3G -ML79		L side (L-ON)	
			D side (D-ON)	
Yes	E3G -MR19T E3G -ML79T		L side (L-ON)	
			D side (D-ON)	

Note: Td1, Td2: Delay time (0 to 5 s)
T_1: A period longer than the delay time.
T_2: A period shorter than the delay time.
* For ON- and OFF-delay timers, Td1 and Td2 are independently variable.

Plug (Sensor I/O Connector)



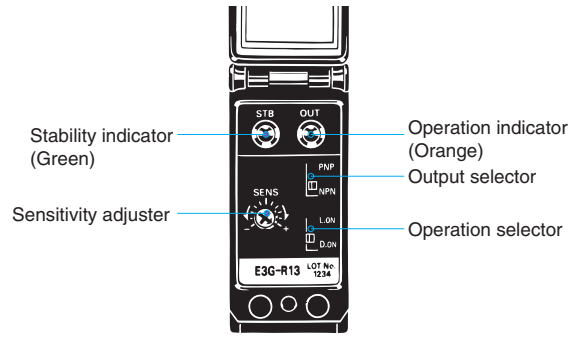
Classification	Wire color	Connector pin No.	Application
DC	Brown	1	Power supply (+V)
	---	2	---
	Blue	3	Power supply (0 V)
	Black	4	Output

Note: Pin 2 is not used.

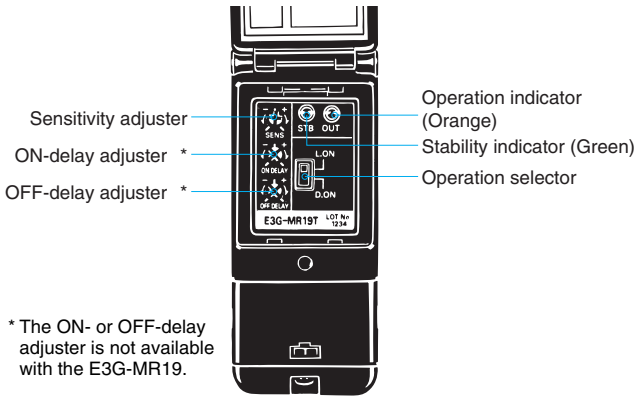
Nomenclature

Retro-reflective

E3G-R13 (Pre-wired Model)
E3G-R17 (Standard Connector Model)



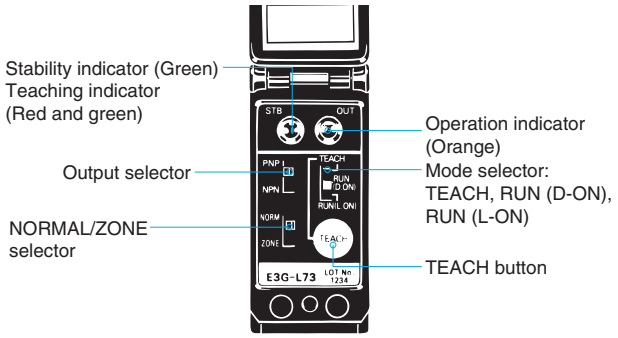
E3G-MR19 (Terminal Block Model)
E3G-MR19T (Terminal Block Model with Timer)



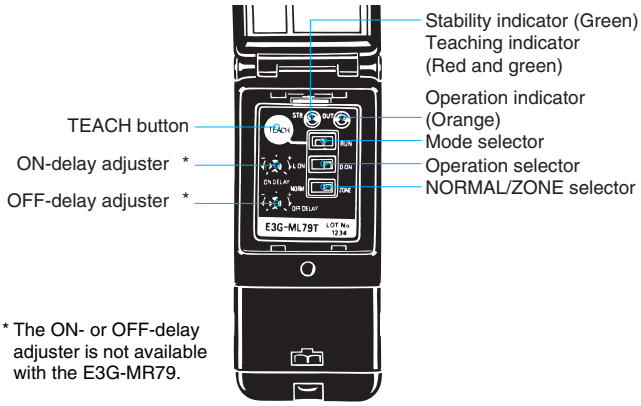
* The ON- or OFF-delay adjuster is not available with the E3G-MR19.

Distance-setting

E3G-L73 (Pre-wired Model)
E3G-L77 (Standard Connector Model)



E3G-ML79 (Terminal Block Model)
E3G-ML79T (Terminal Block Model with Timer)



* The ON- or OFF-delay adjuster is not available with the E3G-MR79.

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.

E3G-R/MR

● Designing

Power Supply

A power supply with full-wave rectification can be connected to the E3G-MR19(T).

● Wiring

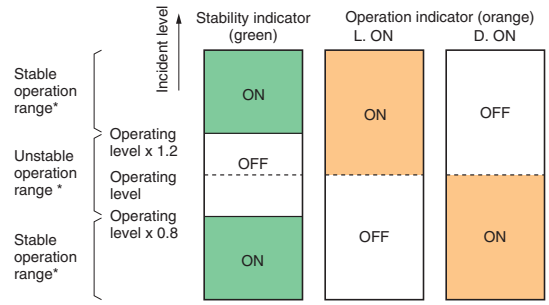
The tensile strength of the cable during operation should not exceed the values shown below.

Model	Tensile strength (torque)
E3G-R13 E3G-MR19(T)	50 N max.
E3G-R17	10 N max.

● Adjusting

Indicators

- The following illustration indicates the operating levels of the E3G.
- Set the E3G so that it will work within the stable operation range.



*If the operating level is set to the stable operation range, the E3G will operate with the highest reliability and without being influenced by temperature change, voltage fluctuation, dust, or setting change. If the operating level cannot be set to the stable operation range, pay close attention to environmental changes while operating the E3G.

E3G-L/ML

● Designing

Power Supply

A power supply with full-wave rectification can be connected to the E3G-ML79(T).

● Wiring

The tensile strength of the cable during operation should not exceed the values shown below.

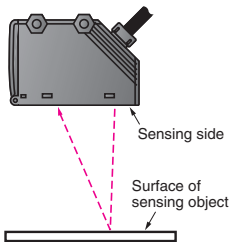
Model	Tensile strength (torque)
E3G-L73 E3G-ML79(T)	50 N max.
E3G-L77	10 N max.

● Mounting

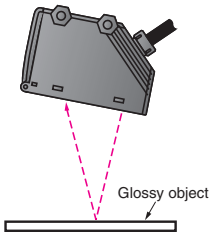
Mounting

Mounting Directions

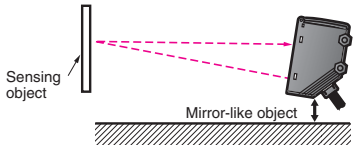
- Make sure that the sensing side of the Sensor is parallel with the surface of each sensing object. Do not incline the Sensor towards the sensing object.



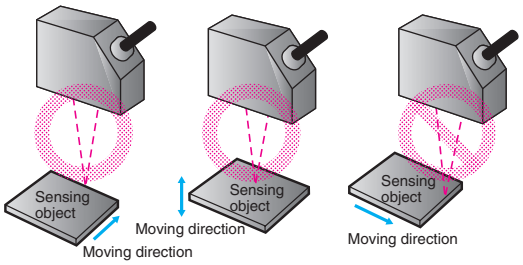
If the sensing object has a glossy surface, incline the Sensor by 5° to 10° as shown below, provided that the Sensor is not influenced by any background objects.



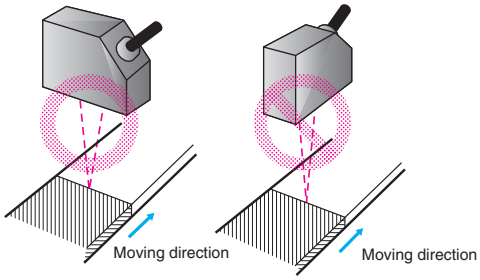
- If there is a mirror-like object below the Sensor, the Sensor may not be in stable operation. Therefore, incline the Sensor or keep the Sensor a distance away from the mirror-like object as shown below.



- Make sure not to install the Sensor in the incorrect direction. Refer to the following.



Install the Sensor as shown in the following if each sensing object greatly differs in color or material.



● Others

EEPROM Write Errors

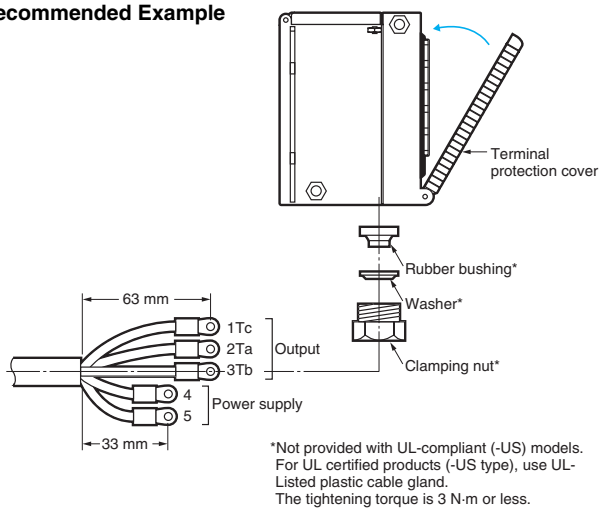
If a teaching data error occurs with the operation indicator flashing due to a power failure or static noise, perform the teaching operation of the Sensor again.

E3G-M□(T)

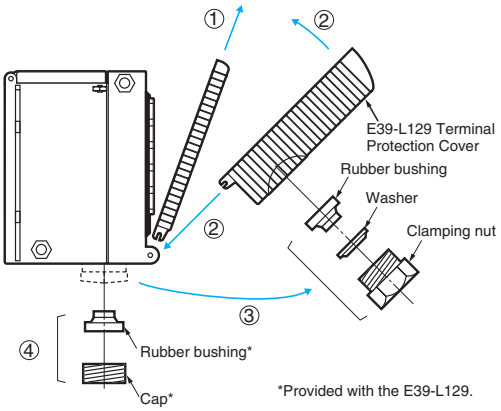
● Wiring

- The cable with an external diameter of 6 to 8 mm is recommended.
- Be sure to attach the cover with screws securely in order to maintain the water- and dust-resistive properties of the product. The size of the conduit opening is PF1/2 in accordance with JIS B0202.
- Do not tighten the Terminal Protection Cover with wires pinched between the Sensor and the cover in order to maintain the water- and dust-resistive properties of the product.

Recommended Example



- Changing to Side-pullout Cable from Vertical-pullout Cable



Procedure	Operation
1	Remove the present cover.
2	Attach the E39-L129 Terminal Protection Cover for side-pullout cable.
3	Remove the clamping nut, washer, and rubber bushing of the E3G. These are used for the side-pullout cable.
4	Attach the rubber bushing and cap provided with the E39-L129 to the E3G as replacements.

All E3G Models

● Designing

Load Relay Contact

If E3G 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 an surge suppressor to the load. Refer to *OMRON's PCB Relays Catalog* (X33) for typical examples of surge suppressors.

● Wiring

Connecting and Wiring

The E3G has a built-in function to protect the E3G from load shortcircuiting. If load shortcircuiting results, the output will be turned OFF. In that case, check the wiring and turn ON the E3G again so that the short-circuit protection circuit will be reset. This function will operate if the output current flow is at least 2.0 times the rated load current. If a capacitive load is connected to the E3G, make sure that the inrush current does not exceed 1.2 times the rated load current.

● Mounting

Mounting Conditions

- If Sensors are mounted face-to-face, make sure that no optical axes cross each other. Otherwise, mutual interference may result.
- Be sure to install the Sensor carefully so that the directional angle range of the Sensor will not be directly exposed to intensive light, such as sunlight, fluorescent light, or incandescent light.
- Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will loose its water-resistive properties.
- Use M4 screws to mount the Sensor.
- When mounting the case, make sure that the tightening torque applied to each screw does not exceed 1.2 N·m.

● Water Resistance

Tighten the operation cover screws and terminal block cover screws to a torque of 0.3 to 0.5 N·m in order to ensure water resistivity.

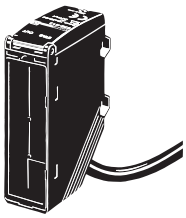
Dimensions

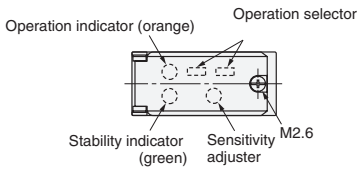
(Unit: mm)
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

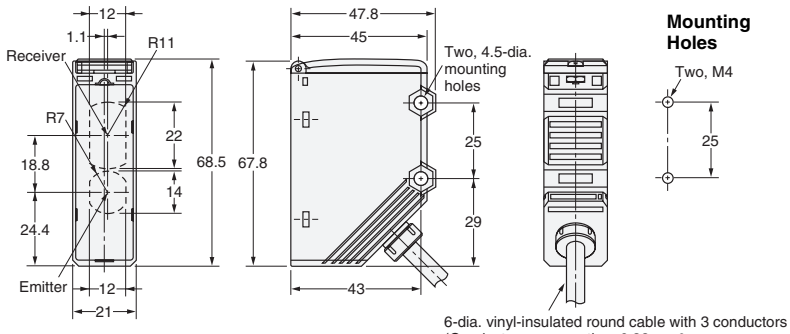
Sensors

Retro-reflective Models

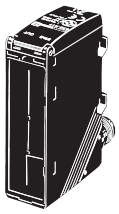
Pre-wired Model
E3G-R13



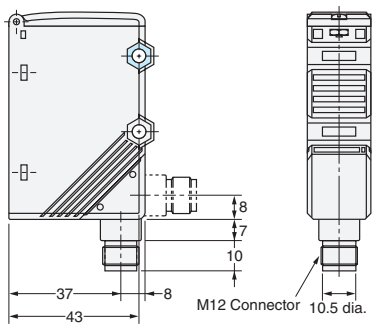




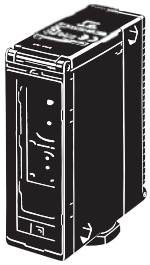
Standard Connector Model
E3G-R17

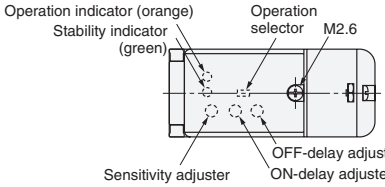


Note: All dimensions other than the ones specified below are the same as the corresponding dimensions of E3G-R13.

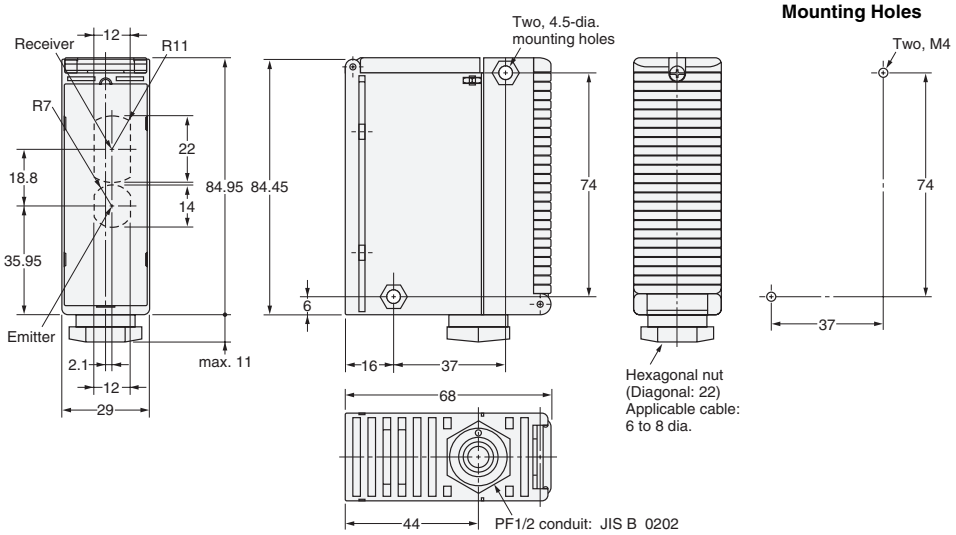


Terminal Block Models
E3G-MR19
E3G-MR19T



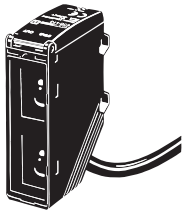


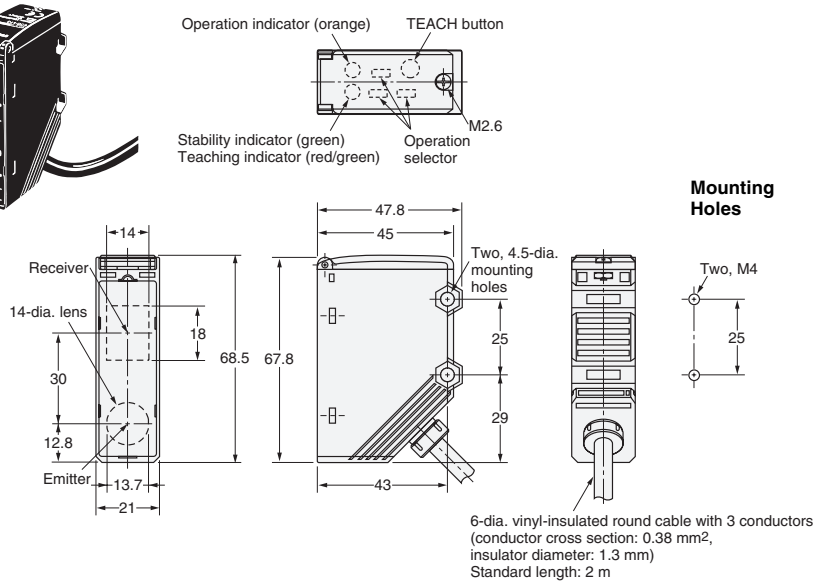
*The ON- or OFF-delay adjuster is not available with the E3G-MR19.



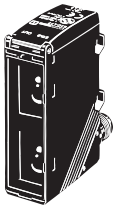
Distance-setting Models

Pre-wired Model
E3G-L73

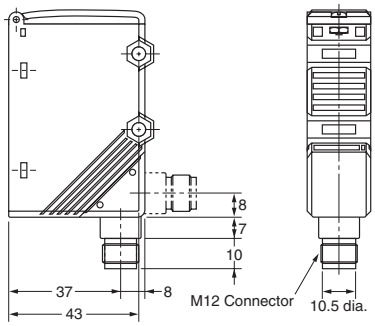




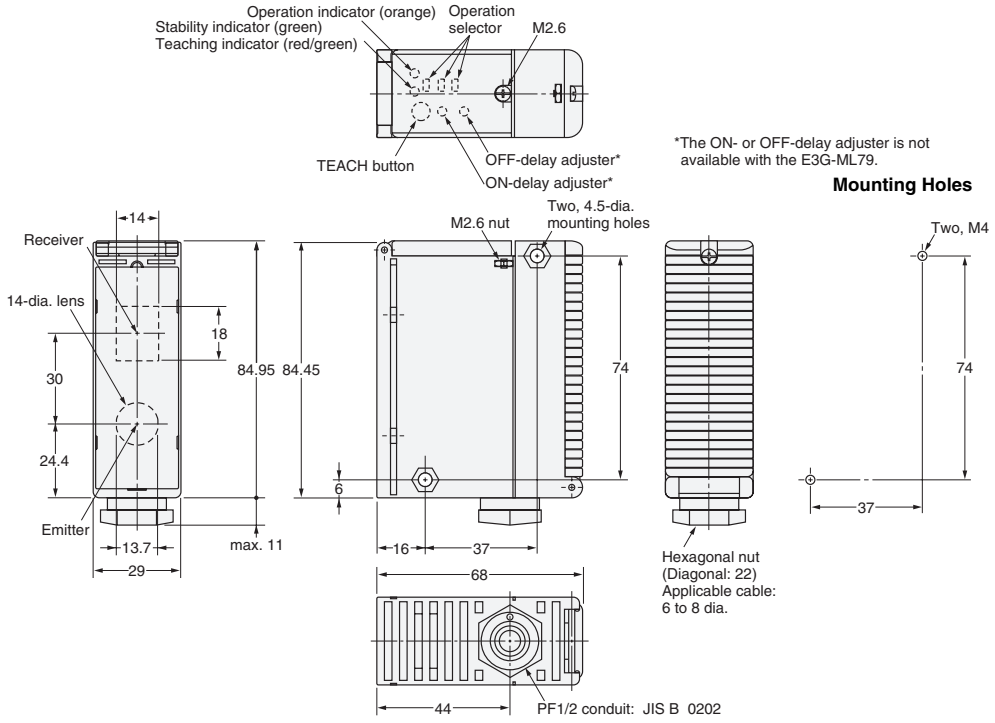
Standard Connector Model
E3G-L77



Note: All dimensions other than the ones specified below are the same as the corresponding dimensions of the E3G-L73.



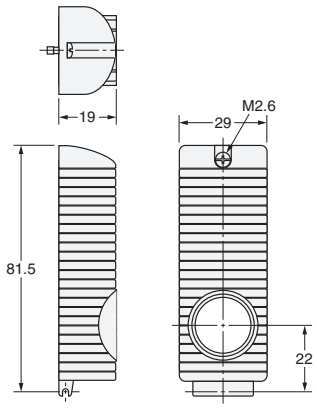
Terminal Block Models
E3G-ML79
E3G-ML79T



Accessories (Order Separately)

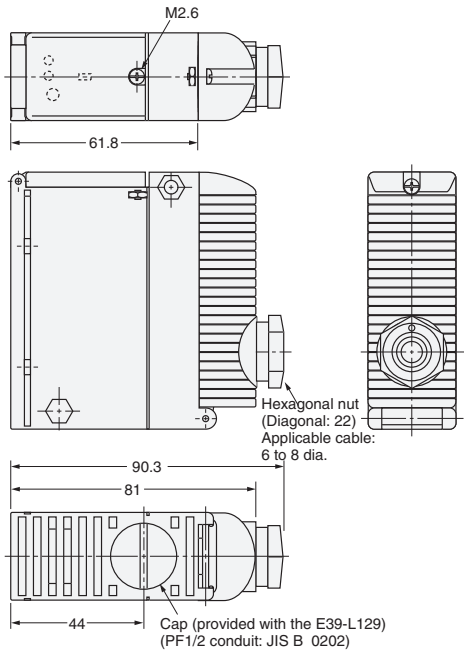
Terminal Protection Cover for Side-pullout Cable

E39-L129



Note: 1. The cover is provided with a rubber bushing and cap to prevent the cable from being pulled out vertically.
2. Refer to page 9 for the mounting method of the product.

Terminal Protection Cover for Side-pullout Cable
(Example: E3G-MR19)



Reflectors

Refer to *E39-L/E39-S/E39-R* for details.

Mounting Brackets

Refer to *E39-L/E39-S/E39-R* for details.

Sensor I/O Connectors

Refer to *Introduction to Sensor I/O Connectors/Sensor Controllers* for details.

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