

Photoelectric Sensors

Optical Fiber	Digital (Autotuning)	E3X-DA-N E32	A-2
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Digital Fiber Amplifier E3X-DA-N

*Truly ultimate fiber amplifier
in pursuit of "user friendliness"
and "high performance"*



* UL-listed including UL991 tests/evaluations • Applicable standard: UL3121-1 • Standards for additional tests/evaluations for applications: UL991, SEMI S2-0200

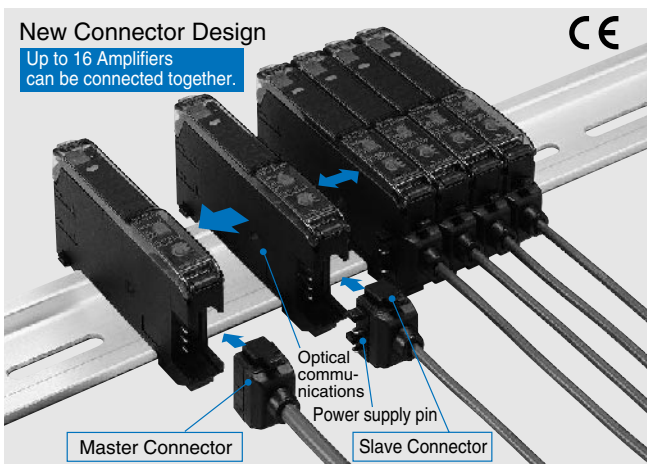
Features

Reducing power line wiring meaning space is saved. New design for easier maintenance.

Industry First Patent pending

The connector type that uses the wire-saving connector supplies power to the single-conductor slave connectors via the three-conductor master connector. Hence, the following three has been made possible.

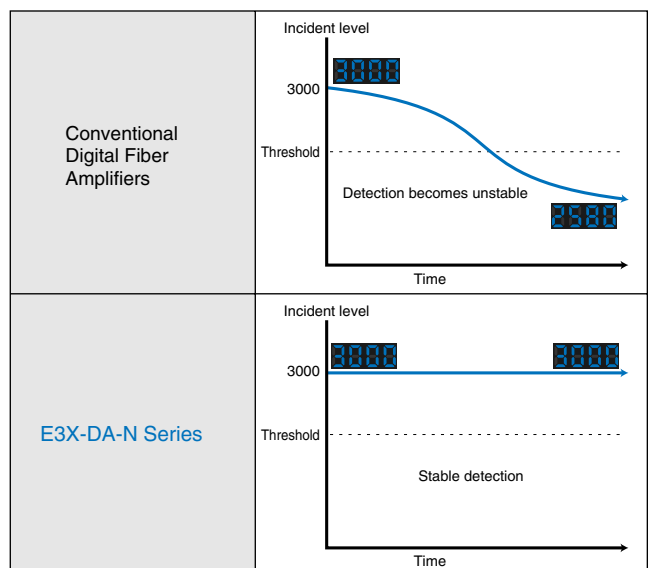
1. Wiring is much simpler.
2. Relay connectors are not required meaning that space is used more efficiently and costs are reduced.
3. Simple inventory control because of no differentiation between master and slave in the amplifier section.



Super digital display by use of the Auto Power Control (APC) circuit

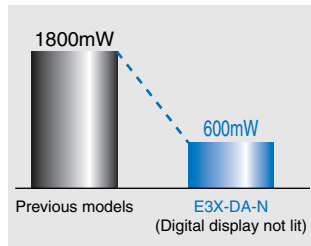
Industry First

The incident level of LEDs used in sensors is prone to deteriorate with time and as a result, detection becomes unstable. Using the APC (auto power control) circuit for the first time as the fiber sensor, the E3X-DA-N series has no digital value variations, realizing severe detection. This makes the E3X-DA-N ideal for applications where a high degree of sensitivity is required, such as detecting crystal glass.



Power consumption reduced by 70%.

Power consumption has been reduced up to about 70% from 1800 mW to 600 mW. (If the digital display is off)



The digital display can be changed to full-OFF or Dark-ON during RUN. Eco mode

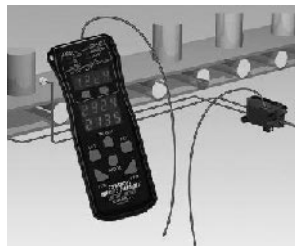
Power consumption can be reduced by setting the display to Full-OFF/Dark-ON in applications where the digital display is rarely looked at during RUN.
(Can be set at the Mobile Console only)

Beeper-sized, new-generation Mobile Console unleashing the power of the ultimate fiber amplifier

Remote setting/adjustment function

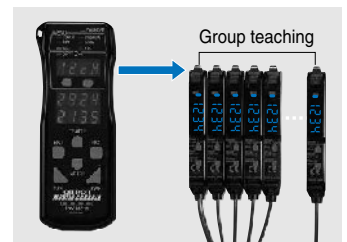
Setting/teaching/fine adjustment can be made at the fiber front-end.

The Mobile Console has enabled setting and teaching at the fiber front-end, which could only be made at the amplifier. You can perform major adjustments while looking at the work position, etc.



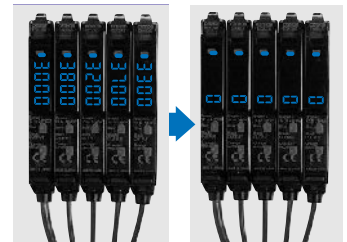
Simultaneous turning possible using group teaching.

While teaching had to be performed for each Amplifier separately, it can now be performed for several Amplifiers at once using the Mobile Console.



Differences in incident light avoided by group zero-reset.

The incident levels of several amplifiers can be batch-reset to zero by the group zero-reset. This feature is useful for reducing differences between the amplifiers.



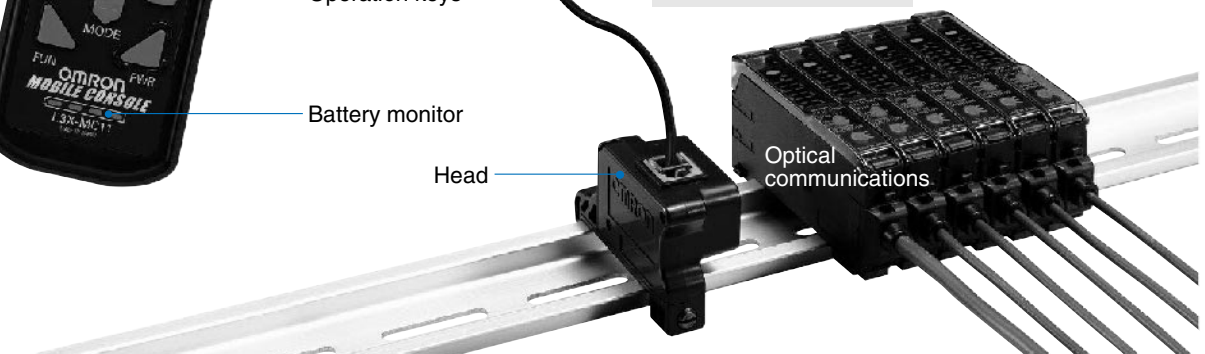
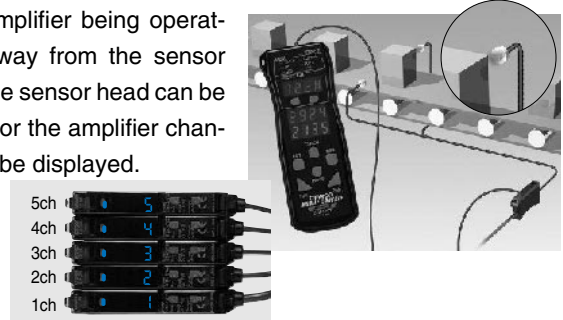
Incident level and threshold can be displayed simultaneously.

New Concept
Patent pending



Sensor head flashing during Amplifier operation
Alternatively, the amplifier channel can be displayed.

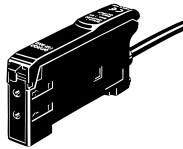
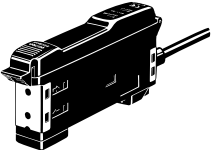
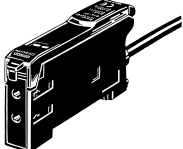
If the amplifier being operated is away from the sensor head, the sensor head can be flashed or the amplifier channel can be displayed.





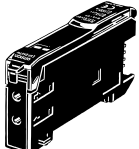
Ordering Information

amplifier units


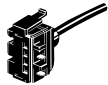
Prewired

Item	Shape	Control output	Model	
			NPN output	PNP output
Standard models		ON/OFF output	E3X-DA11-N	E3X-DA41-N
Monitor-output models		·ON/OFF output ·Monitor output	E3X-DA21-N	E3X-DA51-N
Mark-detecting models (Blue LED)		E3X-DAB11-N	E3X-DAB41-N	
Mark-detecting models (Green LED)		E3X-DAG11-N	E3X-DAG41-N	
Infrared models		E3X-DAH11-N	E3X-DAH41-N	
Differential output type		E3X-DA11D <i>NEW</i>	---	
Water-resistant models		ON/OFF output	E3X-DA11V	E3X-DA41V
Twin-output models			E3X-DA11TW	E3X-DA41TW



Connector type

Item	Shape	Applicable Connector (order separately)		Control output	Model	
					NPN output	PNP output
Standard models		Master	E3X-CN11	ON/OFF output	E3X-DA6	E3X-DA8
		Slave	E3X-CN12			
Monitor-output models		Master	E3X-CN21	·ON/OFF output ·Monitor-output	E3X-DA7	E3X-DA9
		Slave	E3X-CN22			
Mark-detecting models (Blue LED)		Master	E3X-CN11	ON/OFF output	E3X-DAB6	E3X-DAB8
		Slave	E3X-CN12			
Mark-detecting models (Green LED)		Master	E3X-CN11		E3X-DAG6	E3X-DAG8
		Slave	E3X-CN12			
Infrared models		Master	E3X-CN11		E3X-DAH6	E3X-DAH8
		Slave	E3X-CN12			
Differential output type		Master	E3X-CN11		E3X-DA6D <i>NEW</i>	---
		Slave	E3X-CN12			
Water-resistant models (M8 Connector)		XS3F-M421-40□-A XS3F-M422-40□-A			E3X-DA14V	E3X-DA44V
Twin-output models		Master	E3X-CN21		E3X-DA6TW	E3X-DA8TW
		Slave	E3X-CN22			





amplifier units Connectors (Order Separately) Note: Stickers for Connectors are included as accessories.

Item	Shape	Cable length	No. of conductors	Model
Master connector		2 m	3	E3X-CN11
			4	E3X-CN21
Slave connector			1	E3X-CN12
			2	E3X-CN22

Sensor I/O Connectors (Order separately)

Size	Cable type	Shape	Cable length		Model
M8	Standard cable	Straight connector 	2 m	4 conductors	XS3F-M421-402-A
			5 m		XS3F-M421-405-A
		L-shaped connector 	2 m		XS3F-M422-402-A
			5 m		XS3F-M422-405-A

Mobile Console (Order Separately)

Shape	Model	Remarks
	(Set form) E3X-MC11	Mobile Console with head, cable, and AC adapter provided as accessories. Power supply provided by chargeable battery
	E3X-MC11-C1	Mobile Console
	E3X-MC11-H1	Head
	E39-Z12-1	Cable (1.5 m)

In general, amplifier units and connectors are sold separately.

Refer to the following tables for order placement.

amplifier units			Applicable Connector (order separately)	
Type	NPN	PNP	Master connector	Slave connector
Standard models	E3X-DA6	E3X-DA8	E3X-CN11	E3X-CN12
Mark-detecting models	E3X-DAB6	E3X-DAB8		
	E3X-DAG6	E3X-DAG8		
Infrared models	E3X-DAH6	E3X-DAH8		
Differential output	E3X-DA6D	---	E3X-CN21	E3X-CN22
Monitor-output models	E3X-DA7	E3X-DA9		
Twin-output models	E3X-DA6TW	E3X-DA8TW		

When using 5 sets

amplifier units (5 Units)	+	1 Master Connector + 4 Slave Connectors
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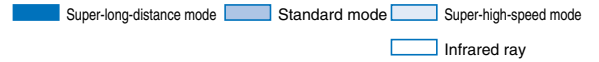
Applicable Fiber Unit Type//Standard Price

Note: 1. (Free-cut) indicates a unit that can be cut freely.

2. The size of standard sensing object corresponds to the fiber core diameter (lens diameter for models with lens).

3. The values of the minimum sensing object for the through-beam models indicate those obtained where the models are set to receive light when the digital incident level exceeds 1,000 (set to digital incident level display).

4. The specifications of E3X-DA□V and E3X-DA□TW are included in E3X-DA□N. E3X-DAG□N is included in the E3X-DAB□N.



Long distance

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object *1(Opaque object) default	Model	Permissible bending radius
M4 (Free-cut)		DA□-N		1.4 mm dia. (0.02 mm dia.)	E32-T11L	25 mm
		DAB11-N				
		DAH□-N				
3.0 mm dia. (Free-cut)		DA□-N		1.4 mm dia. (0.01 mm dia.)	E32-T12L	
M3 (Free-cut)		DA□-N		0.9 mm dia. (0.01 mm dia.)	E32-T21L	10 mm
2 mm dia. (small diameter) (Free-cut)		DA□-N			E32-T22L	
M14 (Free-cut) With lens, ideal for explosion-proof application		DA□-N			E32-T17L	25 mm

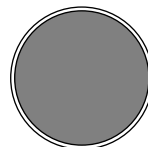
*1. Indicates values for standard mode.

*2. E32-T17L allows a longer sensing distance because its optical fiber length is 10 m.

Flexible fiber models are characterized with "R" at the end of the model number.

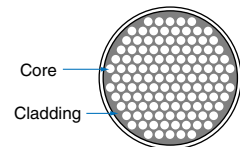
Flexible fiber models are characterized with "R" at the end of the model number.

Flexible fiber contains multiple cores. These cores are all embedded in a cladding, giving a minimum bending radius of 1 mm. The fiber can be bent at right angles without affecting the light intensity. Handle it just like any other cable.



Conventional Fiber


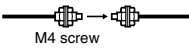
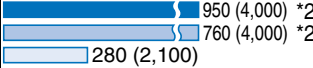
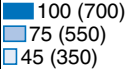


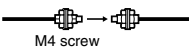
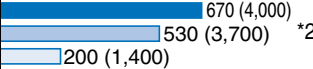

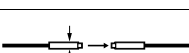
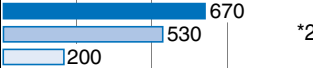

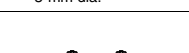






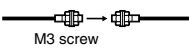

Conventional fiber uses just one core and one cladding section. Bending the fiber may break it or reduce the light intensity.



Flexible Fiber

Flexible fiber contains multiple independent cores all surrounded by cladding. The fiber can be bent without breaking or reducing the light intensity.








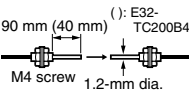
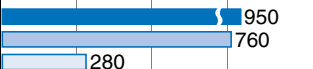


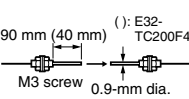

General purpose

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance(mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object *1 (Opaque object) default	Model	Permissible bending radius	
M4 		DA□-N	 950 (4,000) *2 760 (4,000) *2 280 (2,100)	1 mm dia. (0.01 mm dia.)	E32-TC200	25 mm	
		DAB11-N	 100 (700) 75 (550) 45 (350)				
		DAH□-N	 250 200 70				
M4 		DA□-N	 670 (4,000) 530 (3,700) *2 200 (1,400)		E32-ET11R	1 mm	
3.0 mm dia. 		DA□-N	 670 530 200				E32-T12R
M3 		DA□-N	 850 680 250				E32-TC200A
M3 Minute work detection 		DA□-N	 250 220 90	0.5 mm dia. (0.01 mm dia.)	E32-TC200E	10 mm	
		DAB11-N	 25 20 12				
M3 		DA□-N	 150 130 50	0.5 mm dia. (0.01 mm dia.)	E32-ET21R	1 mm	

*1. Indicates values for standard mode.

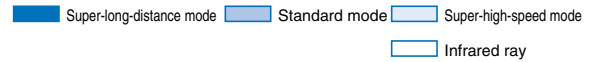
*2. These models allow a longer sensing distance because their optical fiber length is 2 m.

Thin fiber

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object * (Opaque object) default	Model	Permissible bending radius
2 mm dia. Small work detection 		DA□-N	 250 220 90	0.5 mm dia. (0.01 mm dia.)	E32-T22	10 mm
2 mm dia. Small work detection 		DA□-N	 150 130 50		E32-T22R	1 mm
With 1.2 mm dia. sleeve 		DA□-N	 950 760 280	1 mm dia. (0.01 mm dia.)	E32-TC200B E32-TC200B4	25 mm
		DAB11-N	 100 75 45			
With 0.9 mm dia. sleeve 		DA□-N	 250 220 90	0.5 mm dia. (0.01 mm dia.)	E32-TC200F E32-TC200F4	10 mm

* Indicates values for standard mode.

- Note: 1. (Free-cut) indicates a unit that can be cut freely.
 2. The size of standard sensing object corresponds to the fiber core diameter (lens diameter for models with lens).
 3. The values of the minimum sensing object for the through-beam models indicate those obtained where the models are set to receive light when the digital incident level exceeds 1,000 (set to digital incident level display).
 4. The specifications of E3X-DA□V and E3X-DA□TW are included in the E3X-DA□N. E3X-DAG□-N is included in the E3X-DAB□-N.



Flexible (break-resistant) (R4)

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object *1 (Opaque object) default	Model	Permissible bending radius
Ideal for mounting on moving sections (R4) (Free-cut)		DA□-N	850 (4,000) *2 680 (3,600) 250 (1,300)	1 mm dia. (0.01 mm dia.)	E32-T11	4 mm
		DA□-N	220 200 80	0.5 mm dia. (0.01 mm dia.)	E32-T21	
		DA□-N	220 200 80		E32-T22B	

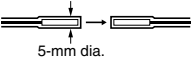
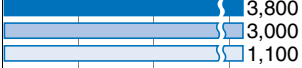
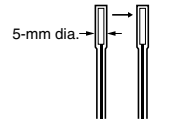
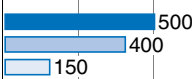
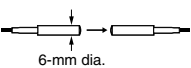
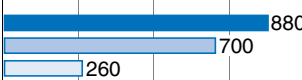
*1. Indicates values for standard mode.
 *2. These models allow a longer sensing distance because their optical fiber length is 2 m.

side view

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object * (Opaque object) default	Model	Permissible bending radius
Long-distance Space-saving (Free-cut)		DA□-N	570 460 170	1 mm dia. (0.01 mm dia.)	E32-T14L	25 mm
		DAB11-N	50 40 25			
		DAH□-N	150 120 40			
Space-saving (Free-cut)		DA□-N	270 210 90	1 mm dia. (0.01 mm dia.)	E32-T14LR	1 mm
Small work detection (small diameter) (Free-cut)		DA□-N	150 130 55	0.5 mm dia. (0.01 mm dia.)	E32-T24	10 mm
Small work detection (small diameter) (Free-cut)		DA□-N	60 50 25	0.5 mm dia. (0.01 mm dia.)	E32-T24R	1 mm
Screw-on model (Free-cut)		DA□-N	4,000 3,400 1,250	4 mm dia. (0.01 mm dia.)	E32-T14	25 mm
		DAB11-N	320 260 160			
		DAH□-N	1,120 900 330			

* Indicates values for standard mode.

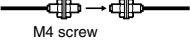
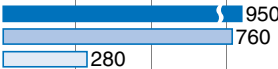
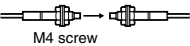
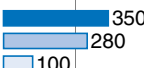
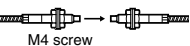
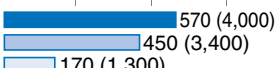
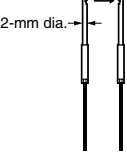
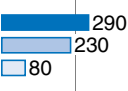
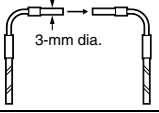
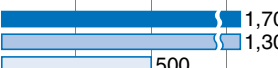
Chemical resistance

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object *1(Opaque object) default	Model	Permissible bending radius
<p>^(Free-cut) Teflon covered, high weathering resistance. Operating ambient temperature: -30 to +70°C</p>	 <p>5-mm dia.</p>	DA□-N		4 mm dia. (0.01 mm dia.)	E32-T12F	40 mm
<p>^(Free-cut) Teflon covered, high weathering resistance at side. Operating ambient temperature: -30 to +70°C</p>	 <p>5-mm dia.</p>	DA□-N		3 mm dia. (0.01 mm dia.)	E32-T14F	
<p>Teflon *2 ensures high weathering resistance. Operating ambient temperature: -40 to +200°C</p>	 <p>6-mm dia.</p>	DA□-N		1 mm dia. (0.01 mm dia.)	E32-T81F	

*1. Indicates values for standard mode.

*2. Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

Heat resistance

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object *1(Opaque object) default	Model	Permissible bending radius
150°C*2 ^(Free-cut) Operating ambient temperature: -40 to +150°C Fiber sheath material: Fluororesin		DA□-N		1.5 mm dia. (0.01 mm dia.)	E32-ET51	35 mm
200°C Operating ambient temperature: -40 to +200°C Flexible: R10 Fiber sheath material: Teflon*3		DA□-N		1 mm dia. (0.01 mm dia.)	E32-T81R	10 mm
300°C*4 With spiral tube, excellent in mechanical strength Operating ambient temperature: -40 to +300°C Fiber sheath material: SUS		DA□-N		1 mm dia. (0.01 mm dia.)	E32-T61	25 mm
150°C ^(Free-cut) side view minute work detection Operating ambient temperature: -40 to +150°C Fiber sheath material: Fluororesin		DA□-N		1 mm dia. (0.01 mm dia.)	E32-T54	35 mm
200°C L-shaped fiber sheath material: SUS		DA□-N		1.7 mm dia. (0.01 mm dia.)	E32-T84S	25 mm

*1. Indicates values for standard mode.

*2. For continuous operation, use the products within the temperature ranging from -40°C to 130°C.

*3. Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

*4. Indicates the heat-resistant temperature at the fiber tip.

*5. These models allow a longer sensing distance because their optical fiber length is 2 m.

Note: 1. (Free-cut) indicates a unit that can be cut freely.


2. The size of standard sensing object corresponds to the fiber core diameter (lens diameter for models with lens).

3. The values of the minimum sensing object for the through-beam models indicate those obtained where the models are set to receive light when the digital incident level exceeds 1,000 (set to digital incident level display).

4. The specifications of E3X-DA□V and E3X-DA□TW are included in E3X-DA□N. E3X-DAG□N is included in the E3X-DAB□N.

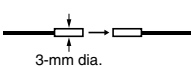
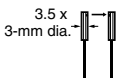
Super-long-distance mode
 Standard mode
 Super-high-speed mode
 Infrared ray

Grooved

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object * (Opaque object) default	Model	Permissible bending radius												
(Free-cut) Detection of film sheet, beam axis adjustment unnecessary, easy installation		DA□-N	<table border="1"> <tr><td>110</td><td></td><td></td><td></td></tr> <tr><td>110</td><td></td><td></td><td></td></tr> <tr><td>110</td><td></td><td></td><td></td></tr> </table>	110				110				110				4 mm dia. (2 mm dia.)	E32-G14	25 mm
		110																
		110																
110																		
DAB11-N	<table border="1"> <tr><td>110</td><td></td><td></td><td></td></tr> <tr><td>110</td><td></td><td></td><td></td></tr> <tr><td>110</td><td></td><td></td><td></td></tr> </table>	110				110				110								
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DAH□-N	<table border="1"> <tr><td>110</td><td></td><td></td><td></td></tr> <tr><td>110</td><td></td><td></td><td></td></tr> <tr><td>110</td><td></td><td></td><td></td></tr> </table>	110				110				110								
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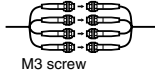







* Indicates values for standard mode.

Narrow vision field

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object * (Opaque object) default	Model	Permissible bending radius												
(Free-cut) Ideal for wafer detection		DA□-N	<table border="1"> <tr><td>2,300</td><td></td><td></td><td></td></tr> <tr><td>1,900</td><td></td><td></td><td></td></tr> <tr><td>700</td><td></td><td></td><td></td></tr> </table>	2,300				1,900				700				1.7 mm dia. (0.01 mm dia.)	E32-T22S	25 mm
2,300																		
1,900																		
700																		
(Free-cut) Side view ideal for wafer detection		DA□-N	<table border="1"> <tr><td>1,700</td><td></td><td></td><td></td></tr> <tr><td>1,300</td><td></td><td></td><td></td></tr> <tr><td>500</td><td></td><td></td><td></td></tr> </table>	1,700				1,300				500				2 mm dia. (0.01 mm dia.)	E32-T24S	10 mm
1,700																		
1,300																		
500																		

* Indicates values for standard mode.

Area sensing

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)	Standard object (mm) Minimum sensing object *1(Opaque object) default	Model	Permissible bending radius
Multi-point detection (4 head)		DA□-N	700 610 250	2.0 mm dia. (0.01 mm dia.)	E32-M21	25 mm
Detects in a 30 mm area		DA□-N	2,300 1,800 660	(0.3 mm dia.) ^{*2}	E32-T16W	10 mm
		DA□-N	1,700 1,300 500	(0.3 mm dia.) ^{*2}	E32-T16WR	1 mm
side view tySide view type ideal for applications with insufficient depth		DA□-N	1,300 1,000 280	(0.2 mm dia.) ^{*2}	E32-T16J	10 mm
		DA□-N	980 750 210	(0.2 mm dia.) ^{*2}	E32-T16JR	1 mm
Detection in area of 10 mm width, long distance		DA□-N	3,500 2,800 1,000	(0.6 mm dia.) ^{*3}	E32-T16	25 mm
Stable detection of minute work in sufficient depth area		DA□-N	1,400 1,100 420	(0.2 mm dia.) ^{*2}	E32-T16P	10 mm
		DA□-N	1,050 840 320	(0.2 mm dia.) ^{*2}	E32-T16PR	1 mm

*1. Indicates values for standard mode.

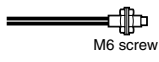
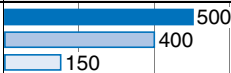


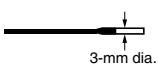
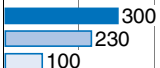
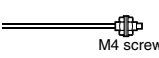
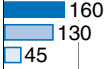
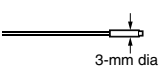
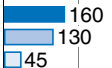
*2. The sensing distance is 300 mm and the value can be detected in each detection area. (Sensing object diameter value in stationary state)

*3. The digital value is 1000 and the value can be detected in each detection area. (Sensing object diameter value in stationary state)

- Note: 1. (Free-cut) indicates a unit that can be cut freely. The unit without the (Free-cut) mark cannot be cut freely.
 2. The values of the minimum sensing object indicate those obtained at a distance where the smallest object can be sensed with the Reflective Fiber Unit.
 3. When set to the maximum sensitivity setting for the internal reflective light, incident light may continue to be received. In such case, use under two-point teaching or without-object teaching.
 4. The specifications of E3X-DA□V and E3X-DA□TW are included in the E3X-DA□N. E3X-DAG□-N is included in the E3X-DAB□-N.

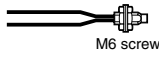
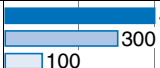


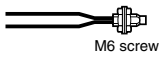
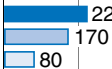
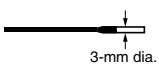
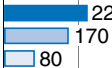
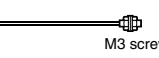


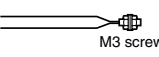

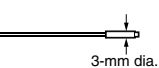

Super-long-distance mode
 Standard mode
 Super-high-speed mode
 Infrared ray

Long distance

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
M6 (Free-cut)		DA□-N		500 x 500 (0.01 mm dia.)	E32-D11L	25 mm
		DAB11-N		100 x 100 (0.1 mm dia.)		
		DAH□-N		200 x 200 (0.01 mm dia.)		
3 mm dia. (small diameter) (Free-cut)		DA□-N		300 x 300 (0.01 mm dia.)	E32-D12	
M4 (Free-cut)		DA□-N		200 x 200 (0.01 mm dia.)	E32-D21L	10 mm
3 mm dia. (small diameter) (Free-cut)		DA□-N			E32-D22L	

*1. Sensing distance indicates values for white paper.
 *2. Indicates values for standard mode.

General purpose

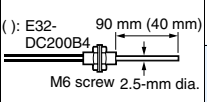
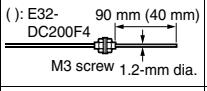
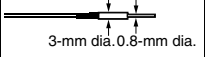
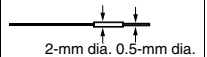
Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
M6 (Free-cut)		DA□-N		400 x 400 (0.01 mm dia.)	E32-DC200	25 mm
		DAB11-N		100 x 100 (0.1 mm dia.)		
		DAH□-N		100 x 100 (0.01 mm dia.)		
M6 (Free-cut)		DA□-N		300 x 300 (0.01 mm dia.)	E32-ED11R	1 mm
3.0 mm dia. (Free-cut)		DA□-N			E32-D12R	
M3 (small diameter) (Free-cut)		DA□-N		100 x 100 (0.01 mm dia.)	E32-DC200E	10 mm
		DAB11-N		25 x 25 (0.2 mm dia.)		
M3 (small diameter) (Free-cut)		DA□-N		50 x 50 (0.01 mm dia.)	E32-ED21R	1 mm
3 mm dia. (small diameter) (Free-cut)		DA□-N			E32-D22R	

*1. Sensing distance indicates values for white paper.
 *2. Indicates values for standard mode.

- Note: 1. (Free-cut) indicates a unit that can be cut freely. The unit without the (Free-cut) mark cannot be cut freely.
 2. The values of the minimum sensing object indicate those obtained at a distance where the smallest object can be sensed with the Reflective Fiber Unit.
 3. When set to the maximum sensitivity setting for the internal reflective light, incident light may continue to be received. In such case, use under two-point teaching or without-object teaching.
 4. The specifications of E3X-DA□V and E3X-DA□TW are included in E3X-DA□N. E3X-DAG□-N is included in E3X-DAB□-N.

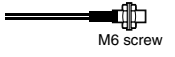
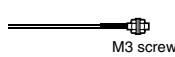
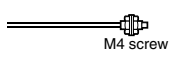
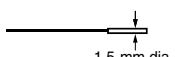
■ Super-long-distance mode
 ■ Standard mode
 ■ Super-high-speed mode
■ Infrared ray

Small diameter head

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
(Free-cut) With 2.5 mm sleeve 		DA□-N	■ 400 ■ 300 ■ 100	400 x 400 (0.01 mm dia.)	E32-DC200B E32-DC200B4	25 mm
		DAB11-N	■ 32 ■ 25 ■ 16	100 x 100 (0.1 mm dia.)		
(Free-cut) With 1.2 mm dia. sleeve 		DA□-N	■ 100 ■ 80 ■ 30	100 x 100 (0.01 mm dia.)	E32-DC200F E32-DC200F4	10 mm
(Free-cut) 0.8 mm minute work detection 		DA□-N	■ 21 ■ 16 ■ 6	25 x 25 (0.01 mm dia.)	E32-D33	4 mm
0.5 mm dia. Very small work detection 		DA□-N	■ 4 ■ 3 ■ 1		E32-D331	


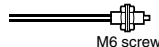
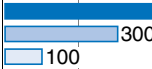



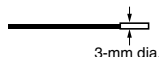





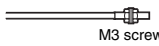


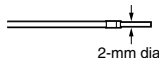


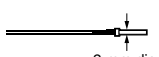

*1. Sensing distance indicates values for white paper.
 *2. Indicates values for standard mode.

Flexible (break-resistant) (R4)

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
(Free-cut) Ideal for installation on moving sections (R4) (Free-cut)		DA□-N	■ 220 ■ 170 ■ 80	300 x 300 (0.01 mm dia.)	E32-D11	4 mm
		DA□-N	■ 40 ■ 30 ■ 10	50 x 50 (0.01 mm dia.)	E32-D21	
		DA□-N	■ 90 ■ 70 ■ 25	100 x 100 (0.01 mm dia.)	E32-D21B	
		DA□-N	■ 40 ■ 30 ■ 10	50 x 50 (0.01 mm dia.)	E32-D22B	

*1. Sensing distance indicates values for white paper.
 *2. Indicates values for standard mode.

Coaxial


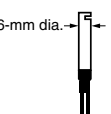



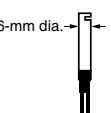


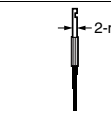

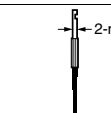

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
M6 precision positioning 	 M6 screw	DA□-N	 400 300 100	500 x 500 (0.01 mm dia.)	E32-CC200	25 mm
		DAB11-N	 32 25 16	100 x 100 (0.1 mm dia.)		
		DAH□-N	 100 75 25	100 x 100 (0.01 mm dia.)		
3 mm dia. (small diameter) precision positioning 	 3-mm dia.	DA□-N	 200 150 50	300 x 300 (0.01 mm dia.)	E32-D32L	
M3 precision positioning 	 M3 screw	DA□-N	 100 75 25	100 x 100 (0.01 mm dia.)	E32-EC31	
M3 precision positioning 	 M3 screw	DA□-N	 45 35 10	Spot diameter*3 0.5 mm dia. 4.0 mm dia. max	50 x 50 (0.01 mm dia.)	
2 mm dia. precision positioning 	 2-mm dia.	DA□-N	 45 35 10	Spot diameter Adjustable in the range 0.1 to 0.6 mm dia.	50 x 50 (0.01 mm dia.)	E32-C42
2 mm dia. precision positioning 	 2-mm dia.	DA□-N	 100 75 25	Spot Diameter Adjustable in the range 0.5 to 1.0 mm dia.	100 x 100 (0.01 mm dia.)	E32-D32

*1. Sensing distance indicates values for white paper.

*2. Indicates values for standard mode.



*3. Refer to page AB- when using the optional lens unit

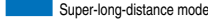
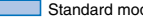
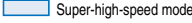

side view

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
6 mm dia. long distance 	 6-mm dia.	DA□-N	 150 110 50	200 x 200 (0.01 mm dia.)	E32-D14L	25 mm
		DAH□-N	 35 25 10	50 x 50 (0.01 mm dia.)		
6 mm dia. 	 6-mm dia.	DA□-N	 60 45 25	100 x 100 (0.01 mm dia.)	E32-D14LR	1 mm
2 mm dia. (small diameter) space saving 	 2-mm dia.	DA□-N	 40 30 10	50 x 50 (0.01 mm dia.)	E32-D24	10 mm
	 2-mm dia.	DA□-N	 25 15 6		E32-D24R	1 mm


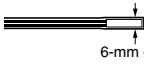

*1. Sensing distance indicates values for white paper.

*2. Indicates values for standard mode.

Note: 1.  indicates a unit that can be cut freely. The unit without the  mark cannot be cut freely.
 2. The values of the minimum sensing object indicate those obtained at a distance where the smallest object can be sensed with the Reflective Fiber Unit.
 3. When set to the maximum sensitivity setting for the internal reflective light, incident light may continue to be received. In such case, use under two-point teaching or without-object teaching.
 4. The specifications of E3X-DA□V and E3X-DA□TW are included in E3X-DA□N. E3X-DAG□-N is included in E3X-DAB□-N.


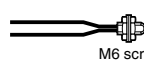
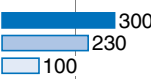
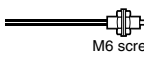

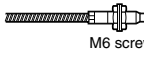

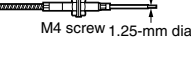

 Super-long-distance mode  Standard mode  Super-high-speed mode
 Infrared ray

Chemical resistance

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
 Teflon-covered *3 High weathering resistance Operating ambient temperature: -30 to +70°C		DA□-N		200 x 200 (0.01 mm dia.)	E32-D12F	40 mm


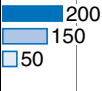
*1. Sensing distance indicates values for white paper.
 *2. Indicates values for standard mode.
 *3. Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

Heat resistance

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
 150°C *3 operating ambient temperature: -40 to +150°C Fiber sheath material: Fluororesin		DA□-N		200 x 200 (0.01 mm dia.)	E32-ED51	35 mm
200°C *4 Operating ambient temperature: -40 to +200°C Fiber sheath material: Fluororesin		DA□-N			E32-D81R <i>NEW</i>	10 mm
300°C Operating ambient temperature: -40 to +300°C Fiber sheath material: SUS		DA□-N			E32-D61	25 mm
400°C Operating ambient temperature: -40 to +400°C Fiber sheath material: SUS		DA□-N		100 x 100 (0.01 mm dia.)	E32-D73	

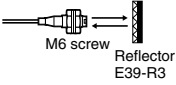
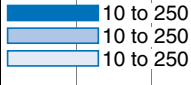
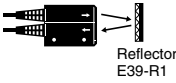

*1. Sensing distance indicates values for white paper.
 *2. Indicates values for standard mode.
 *3. For continuous operation, use the products within the temperature range from -40°C to 130°C.
 *4. Indicates the heat-resistant temperature at the fiber tip.

Area sensing

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
Side view type Wide detection of wide area		DA□-N	 200 150 50	300 x 300 (0.01 mm dia.)	E32-D36P1	25 mm











*1. Sensing distance indicates values for white paper.
*2. Indicates values for standard mode.

Retroreflective

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
Opaque object detection		DA□-N	 10 to 250 10 to 250 10 to 250	35 mm dia. (0.1 mm dia.)	E32-R21 + E39-R3 (Attachment)	10 mm
Opaque object detection Operating ambient temperature: -25 to +55°C Protective structure: IEC 60529 IP66		DA□-N	 150 to 1,500 150 to 1,500 150 to 1,500	35 mm dia. (0.2 mm dia.)	E32-R16 + E39-R1 (Attachment)	25 mm

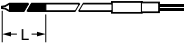



*1. Sensing distance indicates values for white paper.
*2. Indicates values for standard mode.

Limited reflective

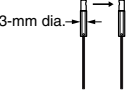
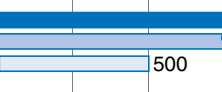
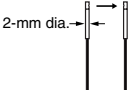
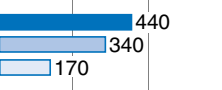
Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)*1	Standard object (mm) Minimum sensing object *2 (Gold wire) default	Model	Permissible bending radius
Ideal for positioning of crystal glass		DA□-N	 4 to 12 4 to 12 4 to 12	100x100 Soda glass with reflection factor of 7%	E32-L56E1 E32-L56E2	35 mm
Wafer/small height difference detection Operating ambient temperature: -40 to +105°C Protective structure: IEC 60529 IP50		DA□-N	 4 ± 2 4 ± 2 4 ± 2	25 x 25 (0.01 mm dia.)	E32-L24L	10 mm
Wafer/small height difference detection Protective structure: IEC 60529 IP50		DA□-N	 7.2 ± 1.8 7.2 ± 1.8 7.2 ± 1.8		E32-L25L	
			DA□-N		 3.3 3.3 3.3	E32-L25
		DA□-N	 3.3 3.3 3.3	E32-L25A		

*1. Sensing distance indicates values for white paper.
*2. Indicates values for standard mode.

Fluid level detection

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)	Standard sensing object	Model	Permissible bending radius
Fluid contact type Unbendable section L = 150, 350 mm (2 types) Operating ambient temperature: -40 to +200°C		DA□-N	---	Pure water at 25°C	E32-D82F1 E32-D82F2	40 mm
^(Free-cut) Tube mounting type Light enters in the presence of fluid Less affected by air bubbles and water drops		DA□-N	Applicable tube: Transparent tube 3.2 mm dia./6.4 mm dia./9.5 mm dia. (FEP make or one having equivalent transparency, recommended wall thickness 1 mm)		E32-A01 ^{NEW}	4 mm
^(Free-cut) Tube mounting type Light enters in the absence of fluid Less affected by air bubbles and water drops		DA□-N	Applicable tube: Transparent tube 6- to 13 mm dia. (FEP make or one having equivalent transparency, recommended wall thickness 1 mm)		E32-A02 ^{NEW}	
Tube mounting type Can detect 4 mm level difference by contact mounting ^(Free-cut)		DA□-N	Applicable tube: Transparent tube 8- to 10 mm dia. (FEP make or one having equivalent transparency, recommended wall thickness 1 mm)		E32-L25T	10 mm

Mapping Sensor

Features	Shape	Compatible amplifier units (E3X-)	Sensing distance (mm)	Standard object (mm) Minimum sensing object * (Gold wire) default	Model	Permissible bending radius
^(Free-cut) Super narrow sight side view opening angle 1.5° ease adjustment	3-mm dia. 	DA□-N	 1,100 890 500	2 mm dia. (0.01 mm dia.)	E32-A03 ^{NEW}	1 mm
^(Free-cut) Narrow sight side view opening angle 3° Easy adjustment	2-mm dia. 	DA□-N	 440 340 170	1.2 mm dia. (0.01 mm dia.)	E32-A04 ^{NEW}	10 mm

* Indicates values for standard mode.

Digital Fiber Amplifier

* Differential output digital fiber amplifier (E3X-DA11D/E3X-DA6D)

Applicable fiber unit characteristic

(Through-beam model)

Fiber type	Sensing distance (mm) (Values in parentheses: When using the E39-F1 lens unit)						Standard object (mm) *1 Minimum sensing object *2 (Opaque object) default
	HIGH			LOW			
	1	2	3-11	1	2	3-11	
	270 or 570μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	270 or 570μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	
E32-ET11R	240 (1680)	280 (1960)	370 (2590)	140(980)	180(1260)	240 (1680)	1 mm dia. (0.01 mm dia.)
E32-ET21R	50	60	80	30	40	50	(0.3 mm dia.)*3
E32-T16WR	580	690	910	350	450	580	(0.2 mm dia.)
E32-T16PR	380	450	600	230	290	380	

*1. The sensing object is operating.

*2. Value applied when the response time is set to 3-11. The value can be detected if the temperature varies within the operating ambient temperature. (Value when the sensing object is operating)

*3. The digital value is 1000 and the value can be detected in each detection area.

Refer to the E3X-DA-N for the note of the fiber unit.

(Reflective model)

Fiber type	Sensing distance (mm)*1						Standard object (mm) *2 Minimum sensing object *3 (Opaque object) default
	HIGH			LOW			
	1	2	3-11	1	2	3-11	
	270 or 570μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	270 or 570μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	
E32-ED11R	80	90	120	45	60	80	150 x 150 (0.01 mm dia.)
E32-ED21R	13	15	20	7	10	13	25 x 25 (0.01 mm dia.)

*1. Sensing distance indicates values for white paper.

*2. The sensing object is operating.

*3. Value applied when the response time is set to 3-11. The value can be detected if the temperature varies within the operating ambient temperature. (Value when the sensing object is operating)

Note: Refer to E3X-DA-N for the note of the fiber unit.

Differences from E3X-DA-N amplifier unit

Item		Differential output type (edge detection type)	
		Prewiring type	amplifier units with Connectors
NPN output		E3X-DA11D	E3X-DA6D
Power consumption		Power consumption 960 mW max. (at power supply voltage 24 V, power consumption 40 mA max.)	
Control output	ON/OFF output	Load current 50 mA (residual voltage NPN/PNP: 1 V max. each) Open collector output type L.ON (ON at edge detection)/D.ON (OFF at edge detection) switch selectable	
Detection mode		One-side edge detection mode/both-side edge detection mode	
Response time		One-side edge detection mode: 270/500 μs/1/2/4/10/20/30/50/100/200 ms selectable Both-side edge detection mode: 570 μs/1/2/4/10/20/30/50/100/200/400 ms selectable	
Functions	Timer function	OFF delay timer for L.ON ON delay timer for D.ON 0 to 5 s (1 to 20 ms: 1 ms increments, 20 to 20 ms: 5 ms increments, 200 ms to 1 s: 100 ms, 1 to 5 s: 1 s increments)	
	APC	Yes	
	Zero reset	Yes (negative indication)	
	Initial reset	Yes (setting conditions initialized)	
	Sensitivity switching	Yes (HIGH/LOW)	
Teaching level		One-point teaching level 1 to 50% variable (1% increments)	
Indicator lamp		Operation indicator (orange), 7-segment incident level display (red), 7-segment digital edge detection level display (red)	

E3X-DA-N

For the outline drawings and other details, refer to the instruction manuals attached to the products.

Rating/Performance

amplifier units

Prewired

Item	Type		Standard models	Monitor-out-put models	Mark-detecting models		Infrared models	Water-resis-tant models	Twin-output models	
	Model	NPN output			E3X-DA11-N	E3X-DA21-N				E3X-DAB11-N
		PNP output	E3X-DA41-N	E3X-DA51-N	E3X-DAB41-N	E3X-DAG41-N	E3X-DAH41-N	E3X-DA41V	E3X-DA41TW	
Light source (wave length)			Red LED (660 nm)		Blue LED (470 nm)	Green LED (525 nm)	Infrared LED (870 nm)	Red LED (660 nm)		
Power supply voltage			12 to 24 VDC ±10%, ripple (p-p) : 10% max.							
Power consumption			Normal: Power consumption 960 mW max. (power consumption 40 mA max. at supply voltage 24 V) Eco mode: Power consumption 720 mW max. (power consumption 30 mA max. at supply voltage 24 V) Digital display OFF: Power consumption 600 mW max. (power consumption 25 mA max. at supply voltage 24 V)							
Control output	ON/OFF output		Load current 50 mA (residual voltage NPN/PNP: 1 V max. each) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON, switch selectable							
	Monitor output		---	1 to 5 VDC, load 10 kΩ min.	---					
Protective circuits			Reverse polarity protection, output short-circuit protection, mutual interference prevention (possible for up to 10 amplifiers)							
Re-sponse time	Super-high-speed mode:		0.25 ms for operation and reset respectively					0.5 ms for operation and reset respectively		
	Standard mode:		Operation/reset: 1 ms each					2 ms for operation and reset respectively		
	Super-long-distance mode:		4 ms for operation and reset respectively					7 ms for operation and reset respectively		
Sensitivity setting			Teaching or manual method							
Func-tions	Timer functions		OFF delay 0 to 200 ms (1 to 20: 1 ms increments, 20 to 200 ms: 5 ms increments), when the Mobile Control is used, select either OFF delay, ON delay or one shot.							
	Automatic power control (APC)		Fiber-optic current digital control			---		Fiber-optic current digital control		
	Zero reset		Yes (negative indication possible)							
	Initial reset		Yes (setting conditions initialized)							
	Monitor focus		---	Upper and lower limit values of output range can be set per digital value of 100	---					
Indicator lamp			Operation indicator (orange), 7-segment digital incident level display (red), 7-segment digital incident level percent display (red), incident level & threshold value double-bar display (green, red), 7-segment digital threshold value display (red)							
Display timing			Normal/peak hold/bottom hold selectable							
Display direction			Normal/reverse selectable							
Optical axis adjustment function			Yes (hyper flashing emission function)							
Ambient lighting			Incandescent lamp: 10,000 lux max. Sunlight 20,000 lux max.							

Item	Model	Type	Standard models	Monitor-out-put models	Mark-detecting models		Infrared models	Water-resis- tant models	Twin-output models
		NPN output	E3X-DA11-N	E3X-DA21-N	E3X-DAB11-N	E3X-DAG11-N	E3X-DAH11-N	E3X-DA11V	E3X-DA11TW
		PNP output	E3X-DA41-N	E3X-DA51-N	E3X-DAB41-N	E3X-DAG41-N	E3X-DAH41-N	E3X-DA41V	E3X-DA41TW
Ambient temperature			Operating: Groups of 1 to 3 amplifiers: -25 to +55°C, Groups of 4 to 11 amplifiers: -25 to +50°C, Groups of 12 to 16 amplifiers: -25 to +45°C Storage: -30 to +70°C (with no icing and condensation)						
Ambient humidity			Operating/Storage: 35% to 85% RH (with no condensation)						
Insulation resistance			20 M Ω min. at 500 VDC						
Dielectric strength			1,000 VAC at 50/60 Hz for 1 minute						
Vibration resistance			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 for 3 times each in X, Y, and Z directions						
Protective structure			IEC 60529 IP50 (with Protective Cover attached)					IEC 60529 IP66 (with protective cover at- tached)	IEC 60529 IP50 (with protective cover attached)
Connection method			Prewired models (standard length: 2 m)						
Weight (Packed state)			Approx. 100 g					Approx. 110 g	Approx. 100 g
Mate- rial	Case		PBT (polybutylene terephthalate)						
	Cover		Polycarbonate					Polyethersul- fone	
Accessories			Instruction manual						

Connector type

Specifications that differ from those of the prewired type

Item	Model	Type	Standard models	Monitor-out-put models	Mark-detecting models		Infrared models	Water-resis- tant models (See note.)	Twin-out- put models
		NPN output	E3X-DA6	E3X-DA7	E3X-DAB6	E3X-DAG6	E3X-DAH6	E3X-DA14V	E3X-DA6TW
		PNP output	E3X-DA8	E3X-DA9	E3X-DAB8	E3X-DAG8	E3X-DAH8	E3X-DA44V	E3X-DA8TW
Connection method			Connector type					M8 connector	Connector
Weight (Packed state)			Approx. 55 g					65 g	Approx. 55 g

* For waterproof type only, voltage resistance is 500 VAC 50/60 Hz 1 min

amplifier unit Connectors

Item	Model	E3X-CN11/21/22	E3X-CN12
Rated current	2.5 A		
Rated voltage	50 V		
Contact resistance	20 mΩ max. (20 mVDC max., 100 mA max.) [By connection with amplifier unit and connection with adjacent connector (except conductor resistance of cable)]		
No. of insertions	50 times (By connection with amplifier unit and connection with adjacent connector)		
Material	Housing	PBT (polybutylene terephthalate)	
	Contacts	Phosphor bronze/gold-plated nickel	
Weight (Packed state)	Approx. 55 g		Approx. 25 g

Mobile Console

Item	Model	E3X-MC11
Supply volt- age	Charged with AC adapter	
Connection method	Connected via adapter	
Weight (packed state)	Approx. 580 g (Console only: 120 g)	
For details of the Mobile Console, refer to the instruction manual attached to the product.		

Fiber Units

Through-beam fiber unit

Type/application		Long distance, general purpose, Thin fiber, side view		Flexible (break-resistant)	Chemical resistant		
Item				E32-T11, E32-T21, E32-T22B	E32-T12F, E32-T14F	E32-T81F	
Ambient temperature	Operation	-40°C to 70°C (with no icing or condensation)				-40° to 200°C (with no icing or condensation)	
	Storage					-40° to 110°C (with no icing or condensation)	
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)					
Permissible bending radius		25 mm min. (10 mm min. for 1 mm dia. fiber)	4 mm min.	40 mm min.	10 mm min.		
Fiber sheath material		Black polyethylene	Vinyl chloride	Teflon (*) covered			
Protective structure		IEC 60529 IP67					

* Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

Type/application		Flexible					
Item		E32-T12R	E32-T22R	E32-T16WR	E32-T16JR E32-T16PR	E32-T24R	E32-T14LR E32-ET11R E32-ET21R
Ambient temperature	Operation	-40° to 70°C (with no icing or condensation)		-25°C to 55°C (with no icing or condensation)	-40° to 70°C (with no icing or condensation)		
	Storage	-40° to 70°C (with no condensation)					
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)					
Permissible bending radius		1 mm min.					
Fiber sheath material		Mixed vinyl chloride	Black polyethylene	Mixed vinyl chloride		Black polyethylene	Mixed vinyl chloride
Protective structure		IEC 60529 IP67		IEC 60529 IP50		IEC 60529 IP67	

Type/application		Heat resistant				
Item		300 °C	200°C		150°C	
		E32-T61	E32-T84S	E32-T81R	E32-ET51	E32-T54
Ambient temperature	Operation	-40° to 300°C *1 (with no icing or condensation)	-40° to 200°C (with no icing or condensation)	-40° to 200°C (with no icing or condensation)	-40° to 150°C *2 (with no icing or condensation)	
	Storage	-40° to 110°C (with no icing or condensation)				
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)				
Permissible bending radius		25 mm min.		10 mm min.	35 mm min.	
Fiber sheath material		SUS303		Fluoro-resin		
Protective structure		IEC 60529 IP67				

*1. Since the heat resistance changes depending on the fiber area, refer to the external dimensions.

*2. For continuous operation, use the products within a temperature range of -40°C to 130°C

Type/application		Slot Sensor	Narrow vision field	Area sensing		
Item		E32-G14	E32-T22S E32-T24S	E32-T16W	E32-T16J	E32-T16 E32-T16P
Ambient temperature	Operation	-40° to 70°C (with no icing or condensation)		-25°C to 55°C (with no icing or condensation)	-40° to 70°C (with no icing or condensation)	
	Storage	-40° to 70°C (with no icing or condensation)				
Ambient humidity		Operating: 35% to 85% RH, storage: 35% to 95% RH (with no icing or condensation)				
Permissible bending radius		25 mm min.	10 mm min.	10 mm min. (25 mm max. for E32-T16 only)		
Fiber sheath material		Black polyethylene	Mixed vinyl chloride	Vinyl chloride (black polyethylene for E32-T16 only)		
Protective structure		IEC 60529 IP67		IEC 60529 IP50 (IP67 for E32-T16 only)		

Type/application		Mapping Sensor	
Item		E32-A03	E32-A04
Ambient temperature	Operation	-40° to 70°C (with no icing or condensation)	
	Storage		
Ambient humidity		Operating: 35% to 85% RH, storage: 35% to 95% RH (with no icing or condensation)	
Permissible bending radius		1 mm min.	10 mm min.
Fiber sheath material		Black polyethylene	
Protective structure		IEC 60529 IP50	

Fiber Units with Reflective Sensor

Type/application		Long distance, general purpose, thin fiber, side view	Coaxial				Flexible (resists breaking)
Item			E32-EC31	E32-EC41	E32-C42	E32-D32	E32-D11, E32-D21, E32-D21B, E32-D22B
Differential distance		20% max. of sensing distance					
Ambient temperature	Operation	-40°C to 70°C (with no icing or condensation)					
	Storage						
Ambient humidity	Operation	35% to 85%RH (with no condensation)					
	Storage	35% to 95%RH (with no condensation)					
Permissible bending radius		25 mm min. (10 mm min. for 1 mm dia. fiber)	25 mm min.			4 mm min.	
Fiber sheath material		Black polyethylene				Vinyl chloride	
Protective structure		IEC 60529 IP67					

Type/application		Flexible			
Item		E32-D12R	E32-D22R, E32-D24R	E32-D14LR, E32-ED11R	E32-ED21R
Differential distance		20% max. of sensing distance			
Ambient temperature	Operation	-40°C to 70°C (with no icing or condensation)			
	Storage				
Ambient humidity	Operation	35% to 85%RH (with no condensation)			
	Storage	35% to 95%RH (with no condensation)			
Permissible bending radius		1 mm min.			
Fiber sheath material		Mixed vinyl chloride	Black polyethylene	Mixed vinyl chloride	Black polyethylene
Protective structure		IEC 60529 IP67			

Type/application		Chemical resistance	Heat resistance			
Item		E32-D12F	150°C	200°C	300 °C	400 °C
			E32-ED51	E32-D81R	E32-D61	E32-D73
Differential distance		20% max. of sensing distance				
Ambient temperature	Operation	-30°C to 70°C (with no icing or condensation)	-40° to 150°C *1 (with no icing or condensation)	-40° to 200°C (with no icing or condensation)	-40° to 300°C *2 (with no icing or condensation)	-40° to 400°C (with no icing or condensation)
	Storage	-30°C to 70°C (with no icing or condensation)	-40° to 110°C (with no icing or condensation)			
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)				
Permissible bending radius		40 mm min.	35 mm min.	10 mm min.	25 mm min.	
Fiber sheath material		Teflon (*3) covered	Fluororesin		SUS	
Protective structure		IEC 60529 IP67				

*1. For continuous operation, use the products within a temperature range of -40°C to 130°C

*2. Since the heat resistance changes depending on the fiber area, refer to the external dimensions on page AB- for details.

*3. Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.

Type/application		Retroreflective		Limited reflective		Area sensing
Item		E32-R21	E32-R16	E32-L25, E32-L25A	E32-L25L, E32-L24L	E32-D36P1
Differential distance		20% max. of sensing distance			5% max. of sensing distance	20% max. of sensing distance
Ambient temperature	Operation	-40° to 70°C (with no icing or condensation)	-25°C to 55°C (with no icing or condensation)	-40° to 70°C (with no icing or condensation)	-40°C to 105°C * (with no icing or condensation)	-40° to 70°C (with no icing or condensation)
	Storage	-40° to 70°C (with no icing or condensation)			-40°C to 95°C (with no icing or condensation)	-40° to 70°C (with no icing or condensation)
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)				
Permissible bending radius		25 mm min.			10 mm min.	25 mm min.
Fiber sheath material		Black polyethylene			Reinforced polyethylene	Black polyethylene
Protective structure		IEC 60529 IP67	IEC 60529 IP66	IEC 60529 IP50		---

* For continuous operation, use the products within a temperature range of -40°C to 90°C.

Type/application		Limited reflective
Item	Model	E32-L56E1/E32-L56E2
Standard sensing object	Soda glass (SCG) having 7% reflection factor T=0.7 end face radius chamfering	
Work inclination	2°	
Sensing position accuracy	+0.1/-0.3	
Differential distance	20% max. of sensing distance	
Ambient temperature	Operation	0°C to 70°C *
	Storage	-40° to 70°C
Ambient humidity	Operation	35% to 85%
	Storage	35% to 95%
Protective structure	IEC 60529 IP40	
Material	Case	Aluminum
	Cover	SPCC steel sheet
	Lens	Glass (BK7)
	Fiber cladding	Fluororesin

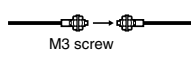
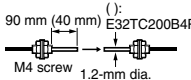
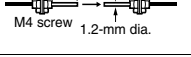
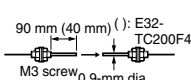
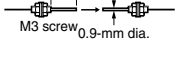
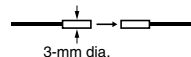
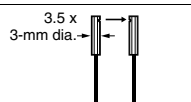
* +200°C for short-time use.

Flexible fiber unit

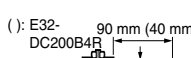
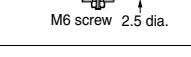
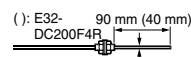
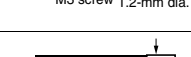
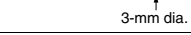

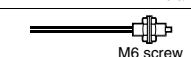
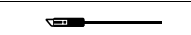


The following fibers are available as flexible type (1 week). (Up to 10 sets) Contact your trading company for the prices, delivery time and types.

Flexible fiber (R1) type

Through-beam

Item	Shape	Model
M3 standard through-beam		E32-TC200AR
Standard sleeve length 90 mm		E32-TC200BR
Standard sleeve length 40 mm		E32-TC200B4R
Standard sleeve length 90 mm		E32-TC200B4R
Standard sleeve length 40 mm		E32-TC200F4R
Narrow vision field		E32-T22SR
Narrow vision field (side view)		E32-T24SR

Reflective model

Item	Shape	Model
Standard sleeve length 90 mm		E32-DC200BR
Standard sleeve length 40 mm		E32-DC200B4R
Standard sleeve length 90 mm		E32-DC200FR
Standard sleeve length 40 mm		E32-DC200F4R
Coaxial 3 mm dia.		E32-D32LR
Coaxial 2 mm dia.		E32-D32R
Coaxial M6		E32-CC200R
Limited reflective		E32-L24LR
Limited reflective		E32-L25LR
Liquid surface		E32-L25TR

Special compatibility of fiber units

Sensing distance (Unit: mm)

Fiber type	Amplifier type	Mode	Standard product	R5	R7.5	R10	R12.5
E32-TC200B		Super-long-distance	950	590	770	840	950
		Standard	760	470	610	670	760
		Super-high-speed	280	170	220	250	280
E32-TC200F	E3X-DA11-N	Super-long-distance	250	110	250	250	250
		Standard	220	100	220	220	220
		Super-high-speed	90	40	90	90	90
E32-DC200F		Super-long-distance	100	70	100	100	100
		Standard	80	55	80	80	80
		Super-high-speed	30	20	30	30	30

Long fiber type

Applicable model (default type)

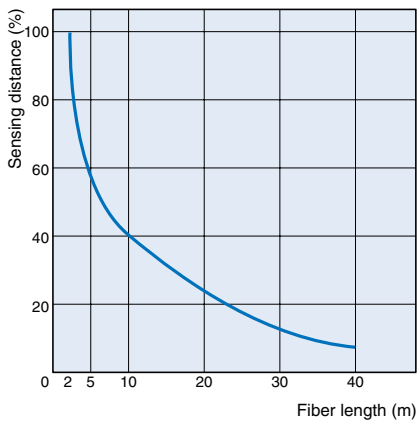
E32-T11L/-D11L, E32-TC200/-DC200, E32-TC200B/-DC200B, E32-TC200E/-DC200E, E32-TC200F/-DC200F, E32-TC200A4E32-T11/-D11



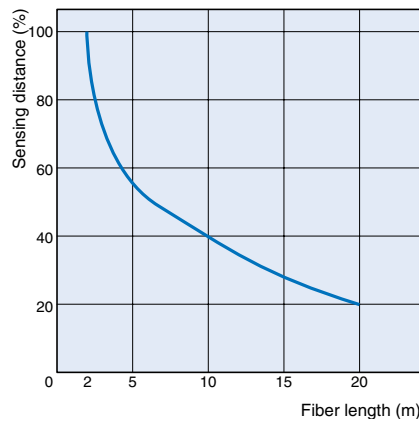
1 m increments in the range $6\text{ m} \leq l \leq 20\text{ m}$ [$l=2\text{ m}$, $l=5\text{ m}$ (E32-T11L/E32-T11/E32-TC200/E32-DC200 only) are standard products.]

Fiber length vs. sensing distance

Through-beam fiber unit (assuming that the fiber length of 2 m is 100%)



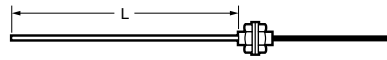
Reflective fiber unit (assuming that the fiber length of 2 m is 100%)



Different stainless steel tube length type

Applicable model

E32-TC200F (tube diameter 0.9 mm) E32-TC200B, E32-DC200F (tube diameter 1.2 mm) E32-DC200B (tube diameter 2.5 mm)



Can be produced within the range 10 mm ≤ L ≤ 120

Tolerance: ±1 mm when L ≥ 40 mm, ±2 mm when L < 40 mm (L = 90 mm, L = 40 mm is a standard product.)

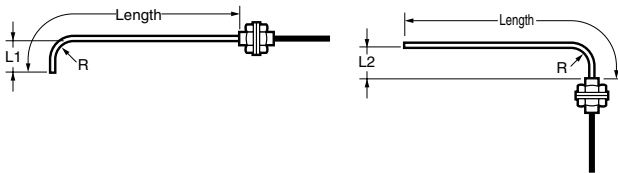
Stainless steel tube front-end or root bent type

Applicable model

E32-TC200B, E32-TC200F, E32-DC200F

(When tube is bent at front end)

(When tube is bent at root)



Bending radius and L1, L2 dimensions (Unit: mm)

Bending radius	Control No.	L1		L2		SUS tube full length
		1	2	3	4	S□
R5	A	10	15	5	10	120 max.
R7.5	B	12.5	17.5	7.5	17.5	
R10	C	15	20	10	20	
R12.5	D	17.5	22.5	12.5	22.5	

Note: Only the products of the above dimensions can be manufactured. If the product is bent to other than the above dimension, the sleeve bender E39-F11 (option) is available.

Type list based on bending radius and L1, L2 dimensions

(When only L1 is specified) (Unit: mm)

Bending radius	L1 (±1)	Model
R5	10	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ A1
	15	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ A2
R7.5	12.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ B1
	17.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ B2
R10	15	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ C1
	20	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ C2
R12.5	17.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ D1
	22.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ D2

- *1. "T" for through-beam type, "D" for reflective type.
- *2. B or "F" at the end of E32-TC200B.
- *3. "50" for 50 mm full length. Full length ≤ 120 mm

(If only L2 is specified) (Unit: mm)

Bending radius	L2 (±1)	Model
R5	5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ A3
	10	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ A4
R7.5	7.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ B3
	17.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ B4
R10	10	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ C3
	20	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ C4
R12.5	12.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ D3
	22.5	E32- ^F ₁ C200 ^F ₂ -S ^F ₃ D4

- *1. "T" for through-beam type, "D" for reflective type.
- *2. B or "F" at the end of E32-TC200B.
- *3. "50" for 50 mm full length. Full length ≤ 120 mm

(When L1 and L2 are both specified) (Unit: mm)

Bending radius	L1 (±1)	L2 (±1)	Model
R5	10	5	E32- ^F ₁ C200 ^F ₂ -A13
	10	10	E32- ^F ₁ C200 ^F ₂ -A14
	15	5	E32- ^F ₁ C200 ^F ₂ -A23
	15	10	E32- ^F ₁ C200 ^F ₂ -A24
R7.5	12.5	7.5	E32- ^F ₁ C200 ^F ₂ -B13
	12.5	17.5	E32- ^F ₁ C200 ^F ₂ -B14
	17.5	7.5	E32- ^F ₁ C200 ^F ₂ -B23
	17.5	17.5	E32- ^F ₁ C200 ^F ₂ -B24
R10	15	10	E32- ^F ₁ C200 ^F ₂ -C13
	15	20	E32- ^F ₁ C200 ^F ₂ -C14
	20	10	E32- ^F ₁ C200 ^F ₂ -C23
	20	20	E32- ^F ₁ C200 ^F ₂ -C24
R12.5	17.5	12.5	E32- ^F ₁ C200 ^F ₂ -D13
	17.5	22.5	E32- ^F ₁ C200 ^F ₂ -D14
	22.5	12.5	E32- ^F ₁ C200 ^F ₂ -D23
	22.5	22.5	E32- ^F ₁ C200 ^F ₂ -D24

- *1. "T" for through-beam type, "D" for reflective type.
- *2. B or "F" at the end of E32-TC200B.

Output Circuit Diagram

NPN output

Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3X-DA11-N E3X-DAB11-N E3X-DAG11-N E3X-DAH11-N E3X-DA11V E3X-DA6 E3X-DAB6 E3X-DAG6 E3X-DAH6 E3X-DA14V	Light ON		L•ON (LIGHT ON)	<p>Connector Pin Arrangement</p> <p>Note: Pin 2 is not used.</p>
	Dark ON		D•ON (DARK ON)	
E3X-DA21-N E3X-DA7	Light ON		L•ON (LIGHT ON)	<p>Note: Load resistance: 10Ωmin.</p>
	Dark ON		D•ON (DARK ON)	
E3X-DA11TW E3X-DA6TW	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	

Note: With E3X-DA□TW models, only channel 1 is output when set for area sensing operation.

L•ON The range between the CH1 and CH2 thresholds turns ON

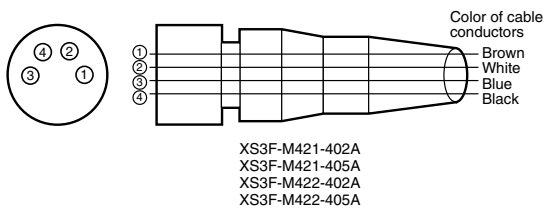
D•ON The range between the CH1 and CH2 thresholds turns OFF (CH2 is always OFF)

PNP output

Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3X-DA41-N E3X-DAB41-N E3X-DAG41-N E3X-DAH41-N E3X-DA41V E3X-DA8 E3X-DAB8 E3X-DAG8 E3X-DAH8 E3X-DA44V	Light ON	Incident light	L•ON (LIGHT ON)	
	Dark ON	Incident light	D•ON (DARK ON)	
E3X-DA51-N E3X-DA9	Light ON	Incident light	L•ON (LIGHT ON)	
	Dark ON	Incident light	D•ON (DARK ON)	
E3X-DA41TW E3X-DA8TW	Light ON	CH1/ Incident light	L•ON (LIGHT ON)	
	Dark ON	CH1/ Incident light	D•ON (DARK ON)	

Note: With E3X-DA□TW models, only channel 1 is output when set for area sensing operation.
 L•ON The range between the CH1 and CH2 thresholds turns ON
 D•ON The range between the CH1 and CH2 thresholds turns OFF (CH2 is always OFF)









Connectors (Sensor I/O Connectors)



Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	Power supply (+V)
	White	②	-
	Blue	③	Power supply (0 V)
	Black	④	Output

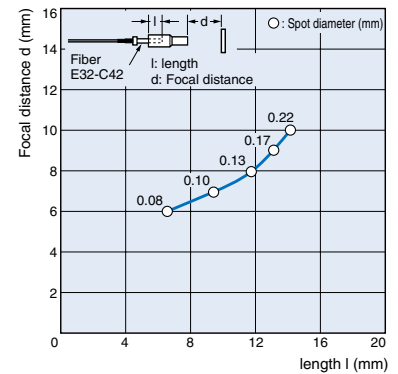
Note: Pin 2 is open.

Lens Unit

Shape	Application	Name	Model	Quantity	Applicable Fiber
	Increased sensing distance	Long distance lens units	E39-F1	A total of two pcs.: One each for emitter and receiver	E32-T11L E32-TC200 E32-T11R E32-T11 E32-T61 E32-T81R
	Conversion of detection direction into side view	side view unit	E39-F2		
	Conversion of through-beam model into long distance reflective model	Lens-equipped reflective Unit	E39-F3	One set	
	Conversion of through-beam model into side view reflective model	Reflective side view conversion attachment	E39-F5	1	E32-TC200A
	Detection at 0.1 to 0.6 mm dia. small spot	Small spot lens unit (variable)	E39-F3A	1	E32-C42 (3 mm dia.)
	Detection at 0.5 to 1 mm dia. small spot				E32-D32 (3 mm dia.)
	Focal length 7 mm Detection at 0.1 mm dia. spot	Small spot lens unit (fixed)	E39-F3A-5	1	E32-EC41
	Detection at 0.5 mm dia. spot in 7 mm focal length				E32-EC31
	17 mm focal length Detection at 0.2 mm dia. spot	Long distance/small spot lens unit (fixed)	E39-F3B	1	E32-EC41
	17 mm focal length Detection at 0.5 mm dia. spot				E32-EC31
	Short body for space-saving, max. 4 mm dia. spot in long 20 mm distance	Long distance lens unit (fixed)	E39-F3C	1	E39-EC31 E32-EC41

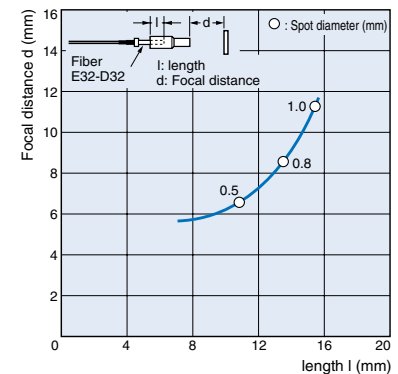
Beam spot characteristic

E39-F3A+E32-C42





Beam spot characteristic

E39-F3A+E32-D32



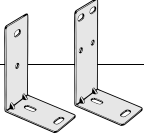
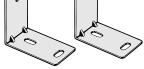


Reflectors

Shape	Name	Sensing distance (default)	Model	Quantity	Remarks
	Reflectors	1.5 m (150 mm) *	E39-R1	1	Retroreflective model attached to E32-R16.
	Small reflector	250 mm (25 mm) *	E39-R3	1	Retroreflective model attached to E32-R21.

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Mounting Brackets

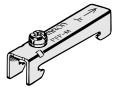
Shape	Applicable type	Model	Quantity	Remarks
	E3X-DA-N series	E39-L143	1	---
	E3X-DA□V	E39-L148		
	E32-T16	E39-L4	1*	Attached to the product.
	E32-T16P	E39-L94	2	---

* For the through-beam type, please order two pcs. for the emitter and receiver.
 Note: For details, refer to "Mounting bracket list".




Operating Instructions Sticker

Model	Remarks
E39-Y1	Apply this seal to near the sensor.






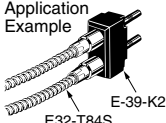
End Plate

Shape	Model	Quantity
	PFP-M	1

Protective Spiral Tubes

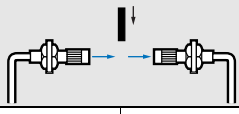
Shape	Application	Model	Tube length	Applicable Fiber
	For protection of fiber	E39-F32A5	500 mm	E32-DC200E E32-D21 E32-DC200F(4) E32-D21R
		E39-F32A	1 m	
		E39-F32B5	500 mm	E32-T21L E32-TC200F(4) E32-TC200E E32-T21 E32-EC31 E32-T21R
		E39-F32B	1 m	
		E39-F32C5	500 mm	E32-T11L E32-T11 E32-TC200 E32-T51 E32-TC200B(4) E32-T11R
		E39-F32C	1 m	
		E39-F32D5	500 mm	E32-D11L E32-D11 E32-DC200 E32-CC200 E32-DC200B(4) E32-ED51 E32-ED11R
		E39-F32D	1 m	

Other Accessories

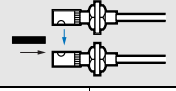
Shape	Application	Name	Model	Applicable Fiber	Remarks
	Used for free cutting of fiber	Fiber Cutter	E39-F4	All fiber unit models that enable free cut	Attached to the fibers that can be cut freely.
	Attachments for small diameter fibers for insertion into amplifier	Attachments for small diameter fibers	E39-F9	E32-T21L E32-DC200E E32-T22L E32-DC200F(4) E32-TC200E E32-D33 E32-T22 E32-ED21R E32-T22R E32-D21 E32-TC200F(4) E32-D32 E32-T21 E32-D24 E32-T24 E32-D24R E32-T24R E32-R21 E32-D21L E32-EC31 E32-ED21R E32-A03 E32-D22L E32-A04 E32-D22R	---
	Used for adding to fiber	Fiber Connector	E39-F10	E32-T11L E32-T14 E32-T12L E32-G14 E32-T17L E32-D11L E32-TC200 E32-DC200 E32-TC200A E32-DC200B(4) E32-TC200B(4) E32-D14L E32-T14L E32-D12	---
	Used for bending the sleeve of sleeved fiber	Sleeve Bender	E39-F11	E32-TC200B(4) E32-TC200F(4) E32-DC200F(4)	---
	Prevention of fiber unit mounting section from breakage	Protective Attachment	E39-K2	E32-T61 E32-T84S	Application Example 

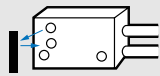
Accessories Rating/Performance

Lens Unit

Item	Name	Long distance lens units						
	Application	Increased sensing distance						
	Model	E39-F1						
	Sensor type	Through-beam 						
Applicable Fiber		E32-T11L	E32-TC200	E32-T61	E32-T11	E32-ET11R	E32-T81R	
E3X-DA-N	Sensing distance	Super-long-distance	4,000 mm	4,000 mm *	4,000 mm *	4,000 mm *	4,000 mm *	2,600 mm
		Standard	3,200 mm	4,000 mm *	3,400 mm	3,600 mm	3,700 mm	2,100 mm
		Super-high-speed	1,200 mm	2,100 mm	1,300 mm	1,300 mm	1,400 mm	750 mm
Standard sensing object		Opaque: 4 mm dia. min.						
Directional angle		5 to 40°						
Differential distance		---						
Ambient temperature		Use the unit within the operating temperature range of the fiber used. When used with E32-T61, use the unit within the range -40 to +200°C.						
Material	Tube:	Brass						
	Lens	Optical glass						

* These models allow a longer sensing distance because their optical fiber length is 2 m.

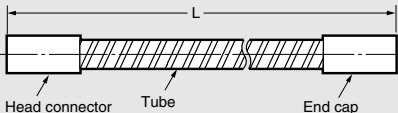
Item	Name	side view unit						
	Application	Conversion of detection direction into side view						
	Model	E39-F2						
	Sensor type	Through-beam 						
Applicable Fiber		E32-T11L	E32-TC200	E32-T61	E32-T11	E32-ET11R	E32-T81R	
E3X-DA-N	Sensing distance	Super-long-distance	900 mm	800 mm	570 mm	780 mm	500 mm	350 mm
		Standard	800 mm	700 mm	450 mm	660 mm	400 mm	280 mm
		Super-high-speed	400 mm	300 mm	170 mm	250 mm	150 mm	100 mm
Standard sensing object		Opaque: 3 mm dia. min.						
Directional angle		20 to 60°						
Ambient temperature		Use the unit within the operating temperature range of the fiber used. When used with E32-T61, use the unit within the range -40 to +200°C.						
Material	Tube:	Brass						
	Lens	Optical glass						

Item	Name	Reflective side view conversion attachment unit	
	Application	Conversion of through-beam model into side view reflective model	
	Model	E39-F5	
	Sensor type	Reflective model 	
Applicable Fiber		E32-TC200A	
E3X-DA-N	Sensing distance (Standard sensing object)	White paper super-long-distance	1 to 130 mm (100 x 100 mm)
		White paper Standard	1 to 120 mm (100 x 100 mm)
		White paper super-high-speed	2 to 45 mm (100 x 100 mm)
Differential distance		20% max. of sensing distance	
Ambient temperature		-40° to 70°C (with no icing or condensation)	
Material	Base:	Brass	
	Reflector:	Stainless steel	

Lens Unit (E39-F3□ series)

Item	Name	Spot lens unit						
	Spot diameter	Adjustable in the range 0.5 to 1.0 mm dia.	Adjustable in the range 0.1 to 0.6 mm dia.	Focal length 7mm 0.5 mm dia. fixed	Focal length 7mm 0.1 mm dia. fixed	Focal length 17mm 0.5 mm dia. fixed	Focal length 17mm 0.2 mm dia. fixed	4 mm max. at 0 to 20 mm
Model	E39-F3A		E39-F3A-5		E39-F3B		E39-F3C	
Applicable fiber type	E32-D32	E32-C42	E32-EC31	E32-EC41	E32-EC31	E32-EC41	E32-EC31	E32-EC41
Material	Tube:	Aluminum						
	Lens	Optical glass						

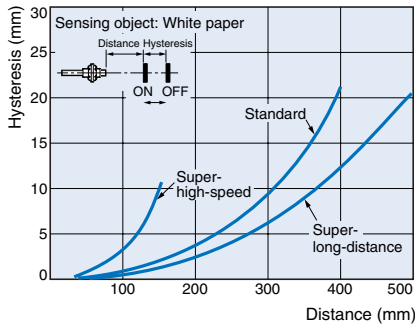
Protective Spiral Tubes

Item	Model	E39-F32A5	E39-F32A	E39-F32B5	E39-F32B	E39-F32C5	E39-F32C	E39-F32D5	E39-F32D
	Sensor type								
Ambient temperature	Operating/Storage: -40 to +150°C (Use the fiber placed inside within the operating temperature of that fiber)								
Ambient humidity	Operating: 35% to 85% Storage: 35% to 95%								
Bending radius	30 mm min.								
Tensile strength	Between head connector or end cap and tube: 1.5 Nm max., tube: 2 Nm max.								
Compression load	Tube: 29.4 N max.								
Material	Head connector	Brass nickel plating							
	End cap	Brass nickel plating							
	Tube	Stainless steel (SUS304)							

Characteristic data (default)

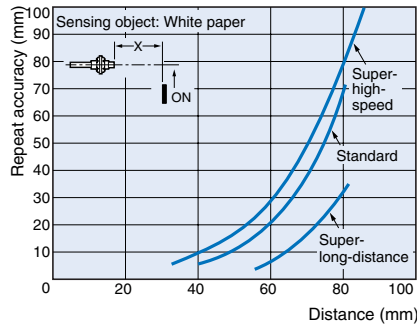
Hysteresis vs. sensing distance

Reflective model
E32-D11L



Repeated accuracy vs. sensing distance

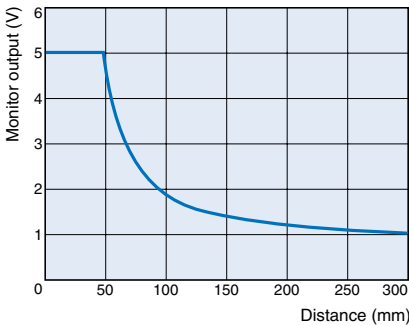
Reflective model
E32-DC200



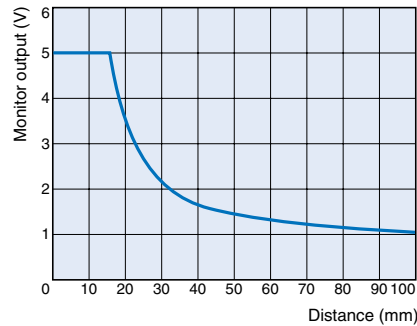
Monitor output vs. distance

(In standard mode)

Through-beam
E32-TC200

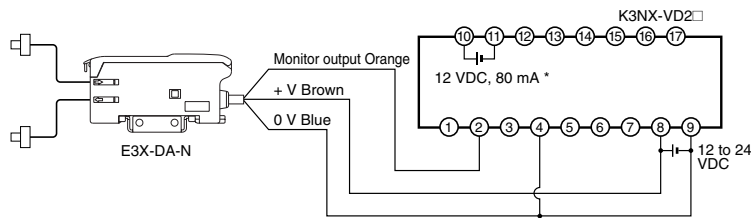


Reflective model
E32-DC200



Connection

Connection with linear sensor controller K3NX-VD2

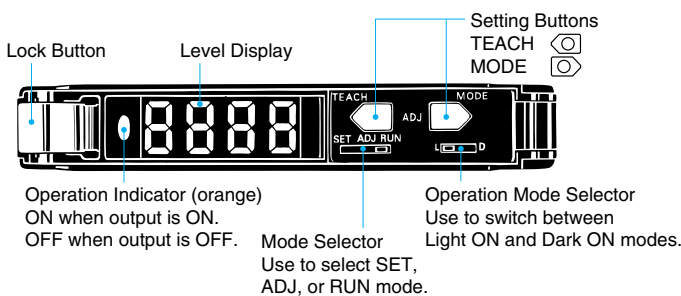


- * Use this service power supply for the Sensor with reference to the power consumption of each Sensor.
- Note: 1. Various I/O Units are available for the K3NX. Select an appropriate output type depending on the application.
- 2. For details about the K3NX, refer to the K3NX Datasheet (N084) or the K3NX Operation Manual (N90).
- 3. This wiring is for the K3NX, with DC power supply specifications and the Monitor (Analog) Sensor with DC power supply specifications. Check respective power supply specifications before wiring them.

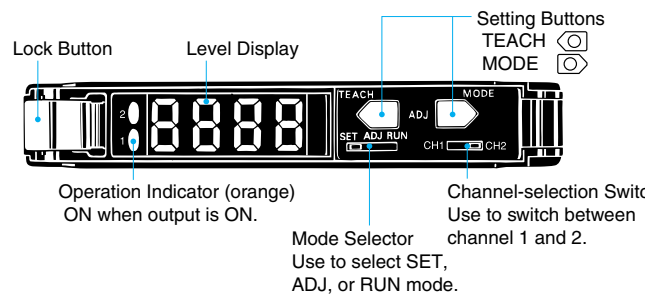
Nomenclature:

amplifier units

Standard, monitor-output, mark-detecting, infrared, and water-resistant models



Twin-output models



Operation

General

1 Changing the Display (RUN Mode)

Set the mode selector to **RUN**.
(Factory-set to RUN)

Digital incident level (4000 max.)
4000

2s MODE

Digital Percent
123%

2s MODE

Analog incident level and threshold

2s MODE

● **Manual Tuning (Fine Sensitivity Adjustment) in ADJ Mode**
Perform fine sensitivity adjustment after teaching and manual tuning (without using the teaching function) in the way shown below:

Twin-output Models

Select the channel to be adjusted using the channel selection switch.

CH1 CH2

Set the mode selector to **ADJ**.

Fine sensitivity adjustment

TEACH MODE

Sensitivity increment with threshold decrement Sensitivity decrement with threshold increment

The items displayed in ADJ mode vary with the display setting in RUN mode.

RUN mode	ADJ mode
Digital incident level	Digital threshold
Digital percent	Digital Percent
Analog value	Analog value

2 Zero-reset (RUN Mode)

Set the mode selector to **RUN**.

Digital incident level (4000 max.)
4000

TEACH 1s

To reset to zero again:

TEACH 1s

To return the initial digital incident level:

TEACH 1s MODE 1s

Hold down both for 3 s

Note: There is no limit on the number of times zero-reset can be used.

3 Initial Reset (SET Mode)

Set the mode selector to **SET**.

TEACH MODE

Hold down both for 5 s

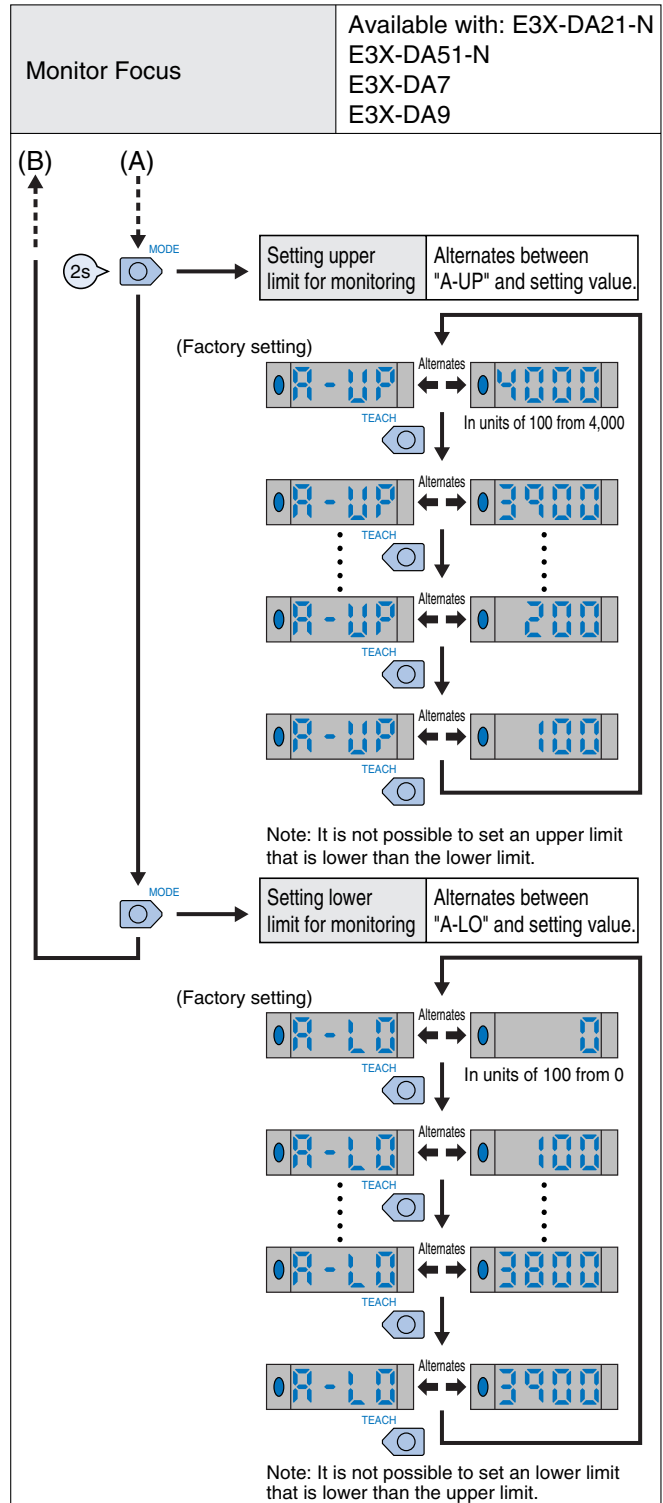
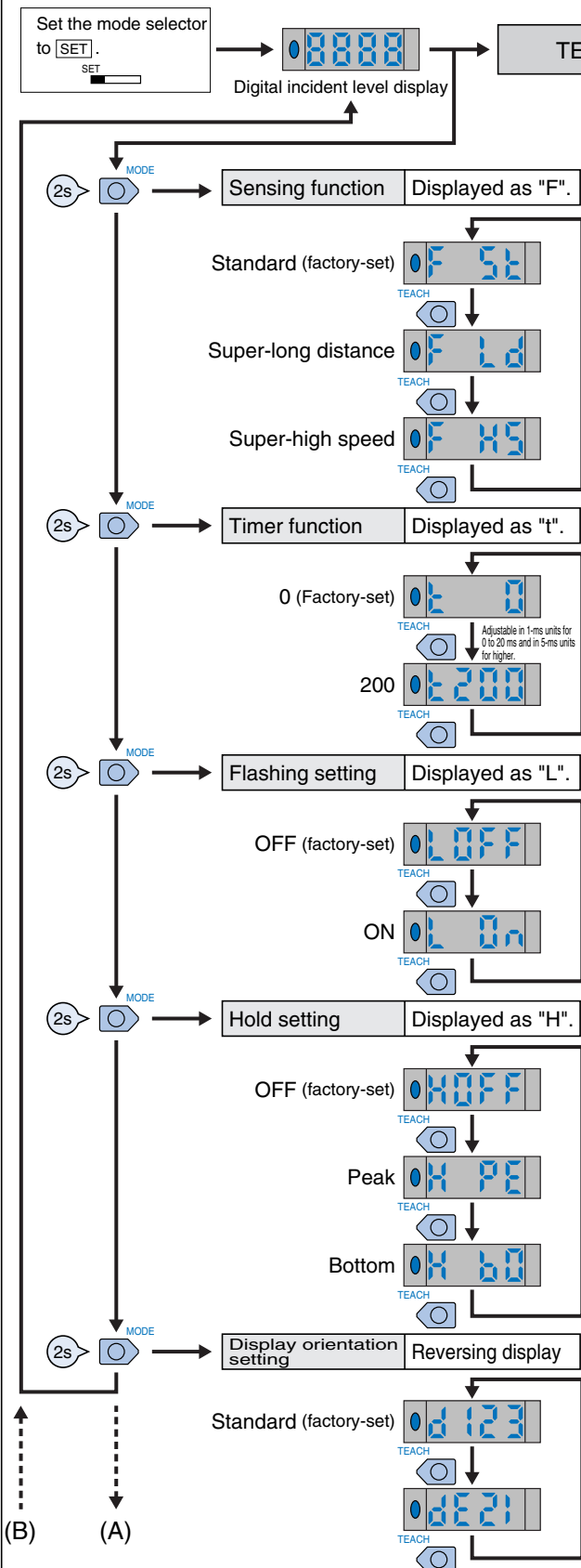
TEACH MODE

n0? 455?

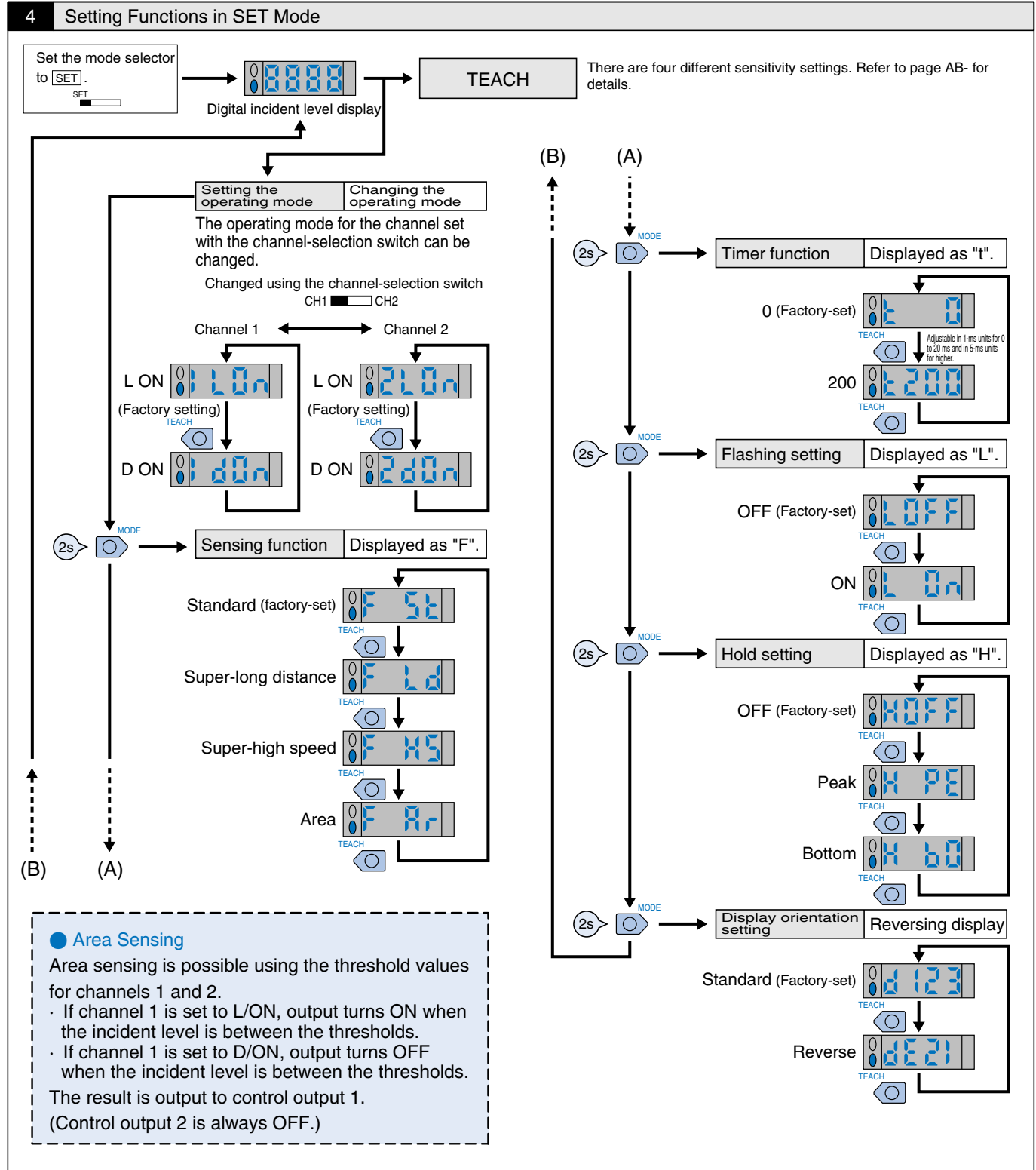
MODE

Cancel Execute initial reset

4 Setting Functions in SET Mode



Twin-output models



General

When teaching is performed (SET mode)

- The four types of teaching given below are available.
- Once setting is made, operation is performed in the preset status thereafter. When a teaching error occurs, the level indicators flash in red. Restart setting from the beginning.

Twin-output models only Select the channel to be adjusted using the channel selection switch. CH1 CH2

Set the mode selector to SET.

Maximum Sensitivity Setting

Procedure	Operation
1	Set the mode selector to SET.
2	Press the TEACH button for 3 seconds min.
3	Setting is completed when the red-lit level indicators turn to green. Then they return to the digital incident level display.
4	Set to RUN mode.

One-point without-object teaching

Procedure	Operation
1	Set the mode selector to SET.
2	Press the SET button once (about 1 s).
3	Setting is completed when the red level indicators are turned ON. They then return to the digital incident level display.
4	Set to RUN mode.
5	The threshold is automatically set with the object.

Note: If one-point teaching is not available because the difference in level is too fine, try two-point teaching.

Operation Mode Selector

Operating mode	Operation
Light ON	L•ON (Factory-set)
Dark ON	D•ON

There is no operation mode selector for twin-output models.
Two-point With/Without-object Teaching

Procedure	Operation
1	Set the mode selector to SET.
2	With the work present, press the SET button once (about 1 s).
3	The level indicators are lit red.
4	If no work is pending, press the SET button once (about 1 s).
5	Setting is completed when the green indicators are turned ON. Then they return to the digital incident level display.
6	Set to RUN mode.

Note: With and without work may be in any order.

Pin-point teaching (for positioning)

Procedure	Operation
1	Set the mode selector to SET.
2	If no work is pending, press the SET button once (about 1 s).
3	The level indicators are lit red.
4	Place the object in the desired position, and press the TEACH button for 3 seconds min.
5	Setting is completed when the green indicators are turned ON. Then they return to the digital incident level display. (Red indicators start flashing if setting is not OK.)
6	Set to RUN mode.

Precautions

Correct Use

Amplifier units

Design

Power ON

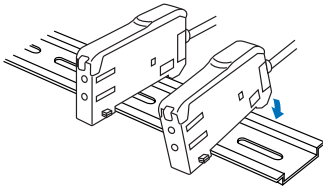
The sensor is ready to sense an object within 200 ms after turning the power ON. If the load and sensor are connected to different power supplies, always turn on the sensor power first.

Mounting

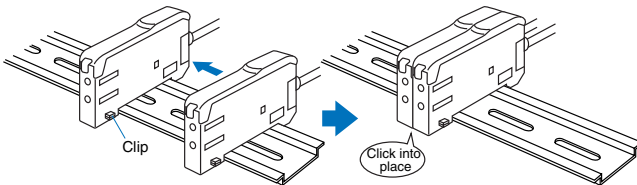
Connection/removing of amplifier units

(Connection)

1. Install the units one by one to the DIN rail.



2. Slide one unit toward the other, match the clips at the front ends, and then bring them together until they "click".



(Removing)

Slide one unit away from the other and remove them one by one. (Do not remove the connected units together from the DIN rail.)

Note: 1. When the amplifier units are connected to each other, the operable ambient temperature changes depending on the number of connected amplifier units. Check "Ratings/Performance".
 2. Before connecting or removing the units, always switch power off.

Adjustment

Mutual interference prevention function

The digital display value may vary due to the light from the other sensor. In that case, low the sensitivity (raise the threshold) to stabilize detection.

EEPROM Write Error

If a write error occurs (operation indicator starts flashing) due to power-off, static electricity or other noise in the teaching mode, perform teaching again.

Optical communication

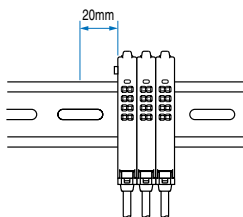
When connecting the amplifier units, assemble them in close contact. During operation, do not slide or dismantle the amplifier units.

Hysteresis adjustment

The Mobile Console allows hysteresis adjustment, but note that the unit may not operate properly if the hysteresis setting is lower than the factory value.

Fitting of Mobile Console head

When fitting the Mobile Console head, a 20 mm or more clearance is needed on the left side.



Use of Mobile Console

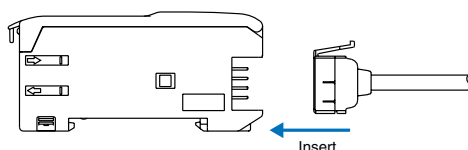
For the twin output type (E3X-DA□□TW), up to 16 channels (eight E3X-DA□□TW units) can be set from the Mobile Console E3X-MC11. (Note that the operation mode and area detection cannot be set.)

Amplifier Unit Connectors

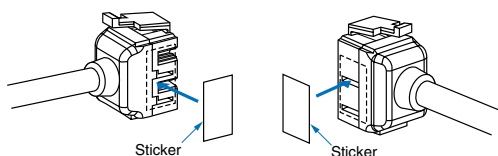
Installation

Connector installation

1. Insert the Master or Slave Connector into the amplifier unit until it clicks into place.



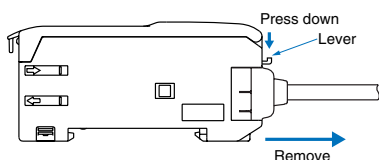
2. Link amplifier units to each other after the master and slave Connectors have been inserted.
3. Apply the supplied seal to the non-connecting surface of the master/slave connector.



Note: Apply seal to the grooved side.

Removing Connectors

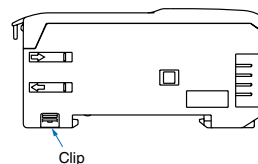
1. Slide the slave amplifier unit (s) on which the connector must be removed from the rest of the group.
2. After the amplifier unit (s) has been separated, press down the lever on the connector and remove it. (Do not attempt to remove connectors without separating them from other amplifier units first.)



Mounting End Plate (PFP-M)

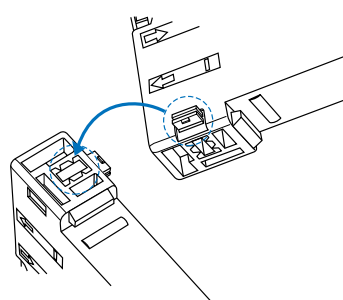
Depending on the installation, an amplifier unit may move during operation. In this case, use an end plate.

Before installing an end plate, remove the clip from the master amplifier unit using a nipper or similar tool.

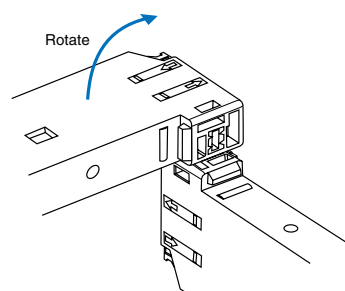


The sensor bottom is also equipped with a clip removing mechanism.

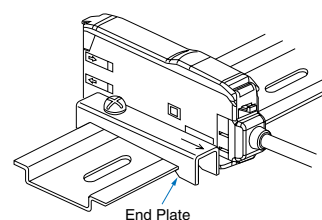
1. Insert the clip to be removed into the slit underneath the clip on another amplifier unit.



2. Remove the clip by rotating the amplifier unit.



When fitting the Mobile Console, set the end plate in the guide as shown in the following figure.



Tensile stress for connectors (including cables)

E3X-CN11, E3X-CN21, E3X-CN22: 30 N max.

E3X-CN12: 12N max.

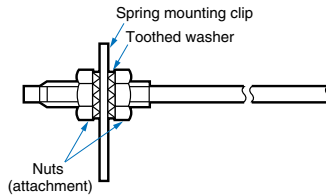
Fiber Units

Installation

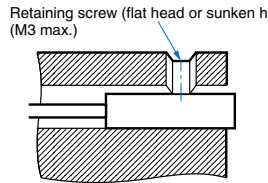
Torque

The tensile force applied to the Fiber Unit should be as follows:

Screw-mounting Model

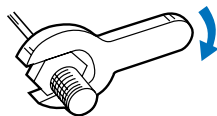


Cylindrical Model



Fiber Units	Clamping torque
M3/M4 screw	0.78 Nm max.
M6 screw/6 mm dia. column	0.98 Nm max.
1.5 mm dia. column	0.2 Nm max.
2 mm dia./3 mm dia. column	0.29 Nm max.
E32-T12F 5 mm dia. Teflon model	0.78 Nm max.
E32-D12F 6 mm dia. Teflon model	
E32-T16	0.49 Nm max.
E32-R21	0.59 Nm max.
E32-M21	Up to 5 mm to the tip: 0.49 Nm max. More than 5 mm from the tip: 0.78 Nm max.
E32-L25A	0.78 Nm max.
E32-T16P E32-T16PR E32-T24S E32-L24L E32-L25L E32-T16J E32-T16JR	0.29 Nm max.
E32-T16W E32-T16WR	0.3 Nm max.

Use a proper-sized wrench.

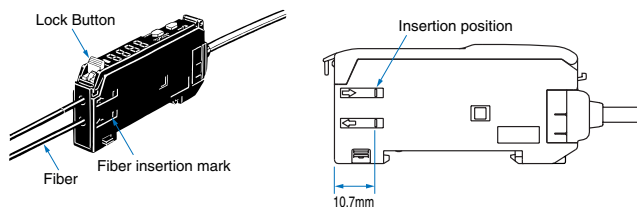


Fiber Connection and Disconnection

The E3X amplifier unit has a lock button. Connect or disconnect the fibers to or from the E3X amplifier unit using the following procedures:

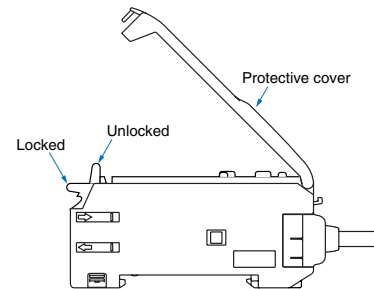
1. Connection

Open the protective cover, insert the fibers according to the fiber insertion marks on the side of the amplifier unit, and lower the lock button.



2. Disconnection

Remove the protective cover and raise the lock button to pull out the fiber.



Note: To maintain the fiber properties, confirm that the lock is released before removing the fiber.

3. Precautions for Fiber Connection/Disconnection

Be sure to lock or unlock the lock button within an ambient temperature range from -10°C to 40°C.

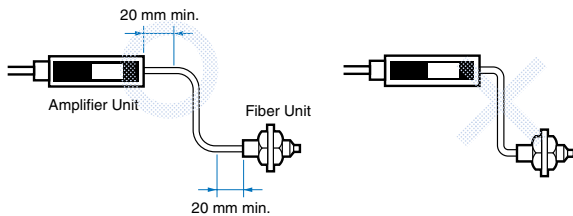
① Cutting Fiber

Cut a thin fiber as follows:

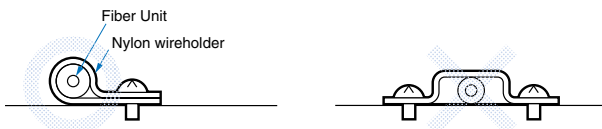
①	An attachment is temporarily fitted to a thin fiber before shipment.	
②	Secure the attachment after adjusting the position of it in the direction indicated by the arrow.	
③	Insert the fiber to be cut into the E39-F4.	
④	Finished state (proper cutting state)	

② Connection

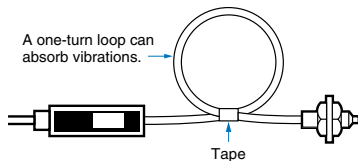
- Do not strain the fiber unit, e.g. do not apply tensile or compression force. (Within 9.8 Nm or 29.4 Nm) Use special care since the fiber is thin.
- The bending radius of the fiber unit should exceed the permissible bending radius given in "Type/standard price" and "Ratings/performance".
- Do not bend the edge of the fiber units (excluding the E32-T□R and E32-D□R).



- Do not apply excess force on the fiber units.

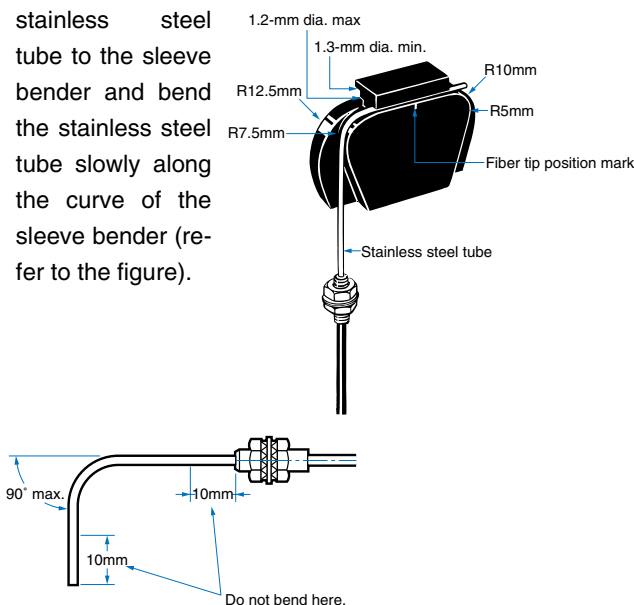


- The fiber head could be break from excessive vibration. To prevent this, the following is applied:



③ E39-F11 Sleeve Bender

- The bending radius of the stainless steel tube should be as large as possible. The smaller the bending radius becomes, the shorter the sensing distance will be.
- Insert the tip of the stainless steel tube to the sleeve bender and bend the stainless steel tube slowly along the curve of the sleeve bender (refer to the figure).

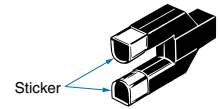


④ Heat-resistant fibers (E32-ED51, E32-ET51)

- The bending radius should be 35 mm up.
- The fiber connector E39-F10 cannot be used for extension.
- +130°C max. for continuous operation at high temperature. The upper limit of the short-time operable temperature is +150°C

⑤ E32-T14/E32-G14

The presence of a reflective object at the front ends of the lenses may place the unit in an incident state. In this case, apply the supplied black seals to the front ends of the lenses.

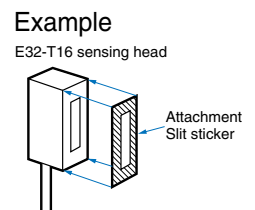


⑥ Wafer sensor (E32-L25 (A))

- Insert the fiber with a white line into the emission side of the amplifier.
- When installing the sensor head, tighten it to the 0.78Nm torque.
- Do not expose the sensor to water.

⑦ Supplied slit for E32-T16

When using the supplied slit, peel off the back paper and apply it along the outline of the sensing surface. For use at 45 mm or less, always fit a slit of 0.5 mm width.



⑧ E32-M21

Set the four fibers at a sufficient distance to avoid interfering with each other.

Adjustment

E32-G14

Because of a short sensing distance, the incident level becomes excessive, disabling "without-work teaching". Use with/without-work teaching.

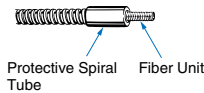
Accessories

Use of E39-R3 Reflector

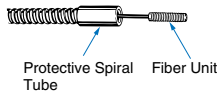
1. When using an adhesive tape on the rear face, apply it after washing off oil, dust, etc. with detergent from the place of application. The reflector cannot be installed if there remains oil, etc.
2. The E39-R3 cannot be used in places where it is exposed to oil or chemicals.

Protective Spiral Tubes

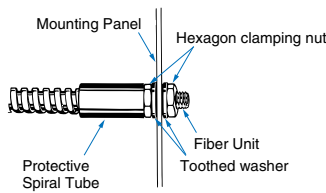
1. Insert a fiber to the protective spiral tube from the head connector side (screwed) of the tube.



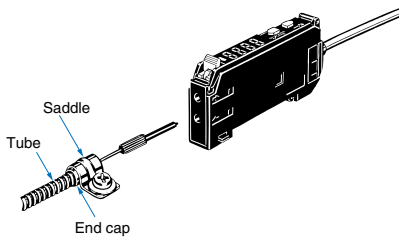
2. Push the fiber into the protective spiral tube. The tube should be straight so that the fiber is not twisted when inserted. Then turn the end cap of the spiral tube.



3. Secure the protective spiral tube at a suitable place with the attached nut.

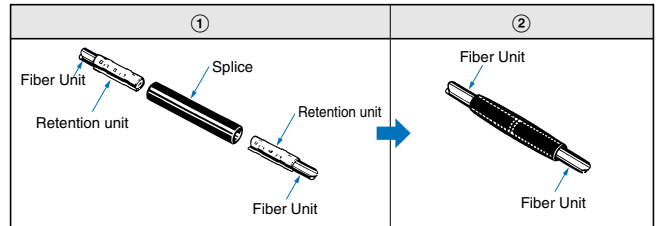


4. Use the attached saddle to secure the end cap of the protective spiral tube. To secure the protective spiral tube at a position other than the end cap, apply tape to the tube so that the portion becomes thicker in diameter.



E39-F10 Fiber Connector

Fit the connector in the following procedure.



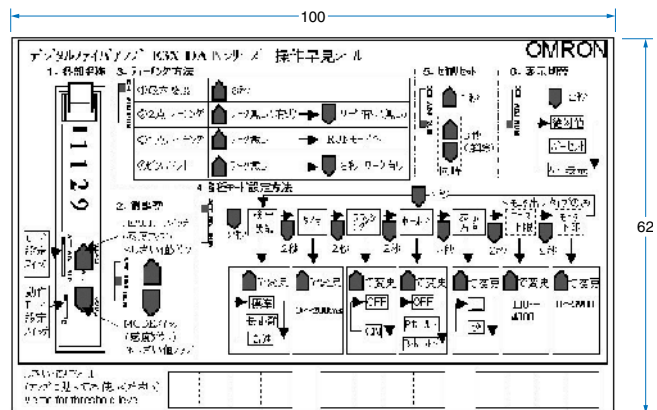
- The fiber units should be as close as possible when they are connected. Sensing distance will be reduced by approximately 25% when fibers are connected.

Only 2.2 mm dia. fibers can be connected.

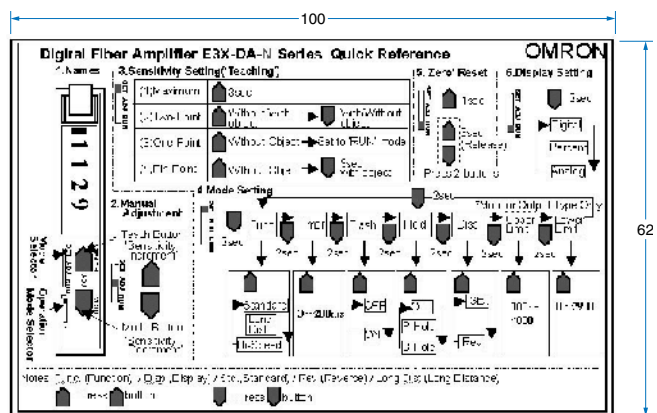
Operating Instructions Sticker E39-Y1

- Apply this seal next to the sensor.
- (1 English and 1 Japanese stickers per set)
- Material: (Front) Paper, (rear) adhesive tape

Japanese Sticker



English Sticker



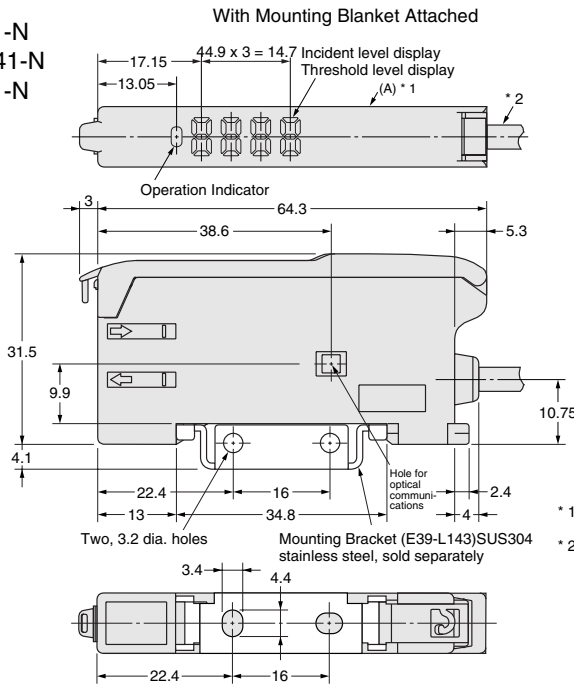
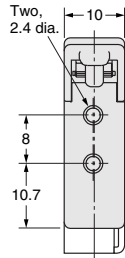
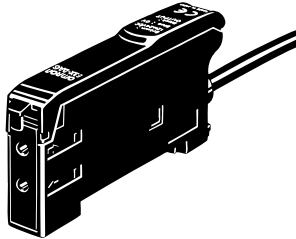
Dimensions (Unit: mm)

Amplifier Units

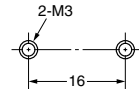
prewired

E3X-DA11-N E3X-DAG11-N E3X-DA21-N
 E3X-DAH11-N E3X-DAB11-N E3X-DAB41-N
 E3X-DA41-N E3X-DAG41-N E3X-DA51-N
 E3X-DAH41-N E3X-DA11D

CAD file E3X_05



Mounting Holes

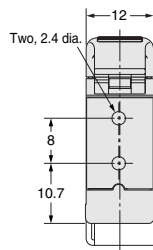
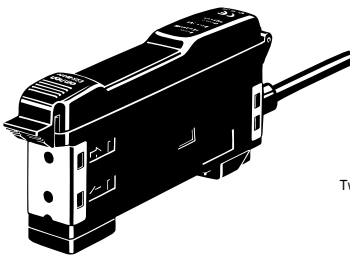


- * 1. The Mounting Bracket can also be used on side A.
- * 2. E3X-DA11-N/DA41-N/DAB11-N: A 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.45 mm²; insulation diameter: 1.1 mm) is used.
- E3X-DA21-N/DA51-N: A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

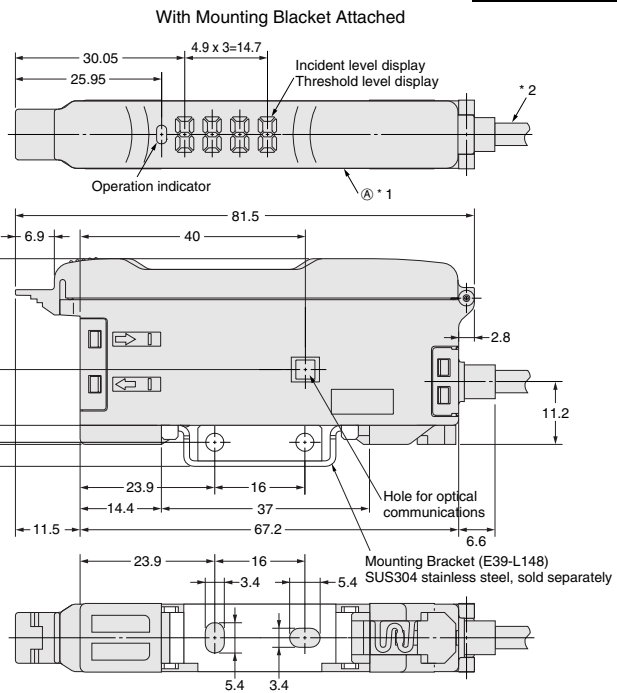
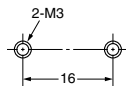
Amplifier units with Cables, Water-resistant Models

E3X-DA11V
 E3X-DA41V

CAD file E3X_10



Mounting Holes



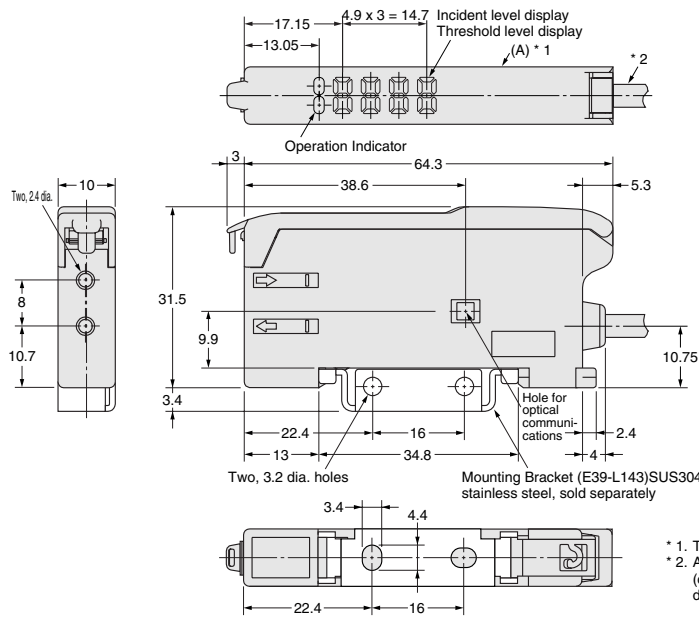
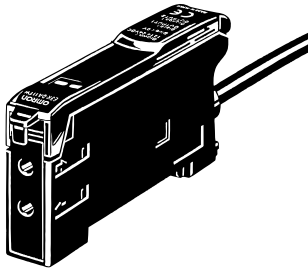
- * 1. The mounting Bracket can also be used on side A.
- * 2. 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Amplifier units with Cables, Twin-output Models

E3X-DA11TW
E3X-DA41TW

With Mounting Blanket Attached

CAD file E3X_05

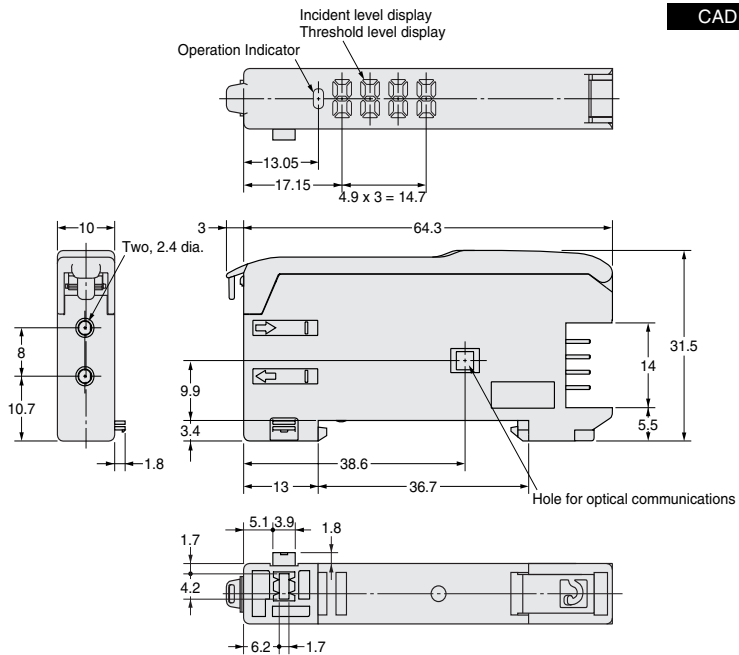
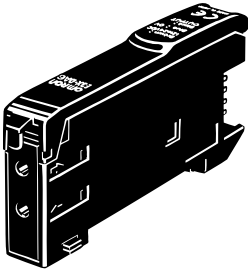


- * 1. The Mounting Bracket can also be used on side A.
- * 2. A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Connector type

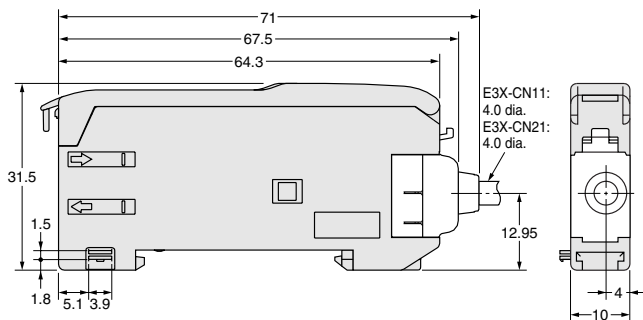
E3X-DA6 E3X-DAG6
E3X-DA7 E3X-DAH6
E3X-DA8 E3X-DAB8
E3X-DA9 E3X-DAG8
E3X-DAB6 E3X-DAH8
E3X-DA6D

CAD file E3X_06



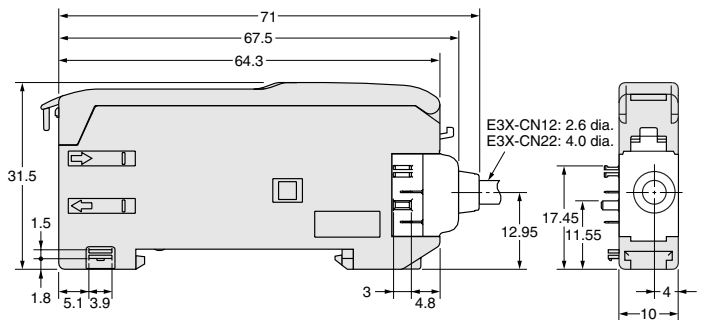
CAD file E3X_07

Dimensions with Master Connector Connected



CAD file E3X_08

Dimensions with Slave Connector Connected



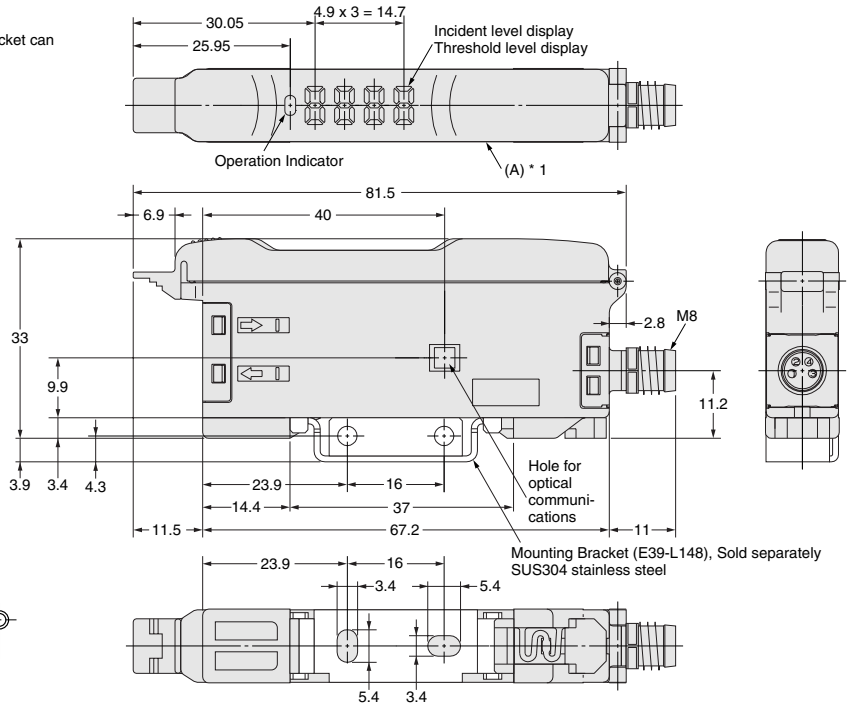
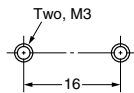
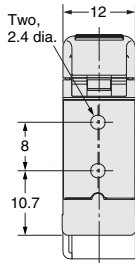
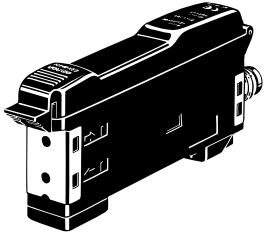
Amplifier Units M8 Connectors,
Water-resistant Models

E3X-DA14V
E3X-DA44V

CAD file E3X_11

* The Mounting Bracket can also be on side A.

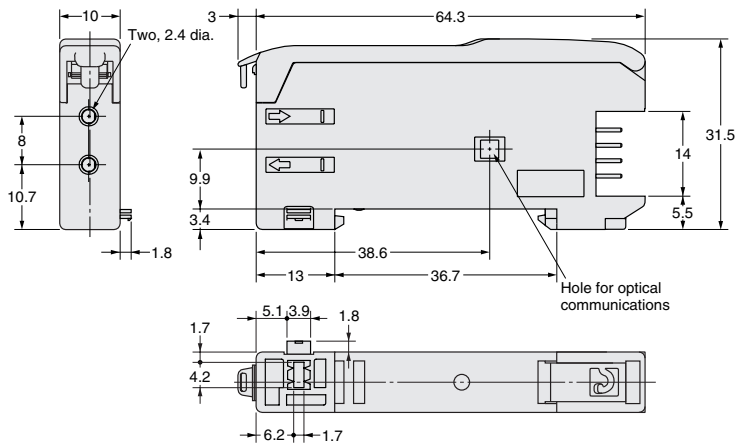
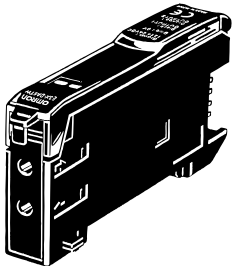
With Mounting Bracket Attached



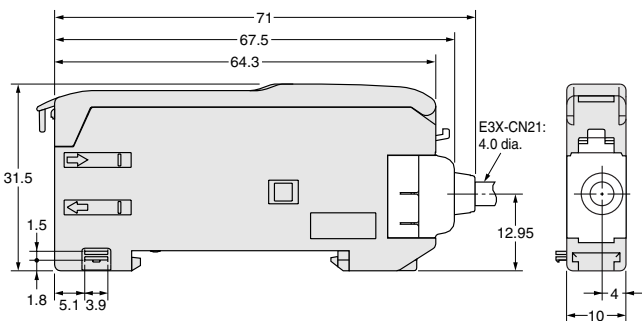
Amplifier units with Standard Connectors,
Twin-output Models

E3X-DA6TW
E3X-DA8TW

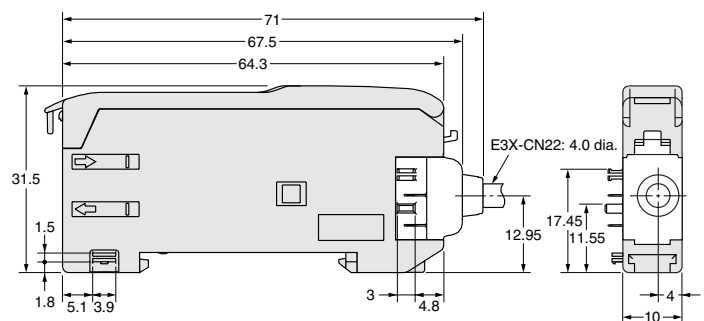
CAD file E3X_06



Dimensions with Master Connector Connected



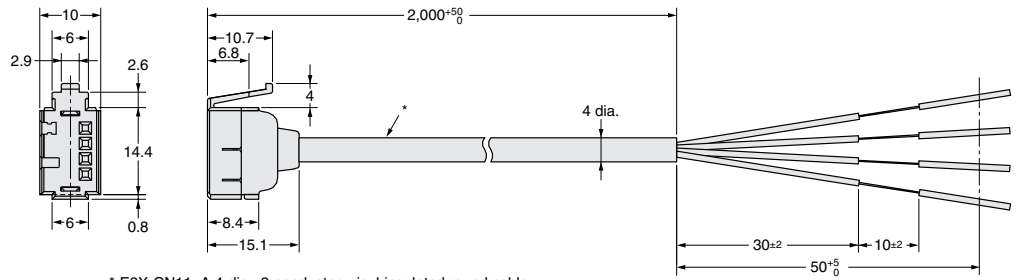
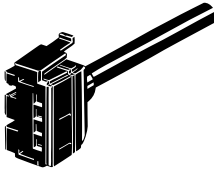
Dimensions with Slave Connector Connected



Amplifier Unit Connectors

Master connector

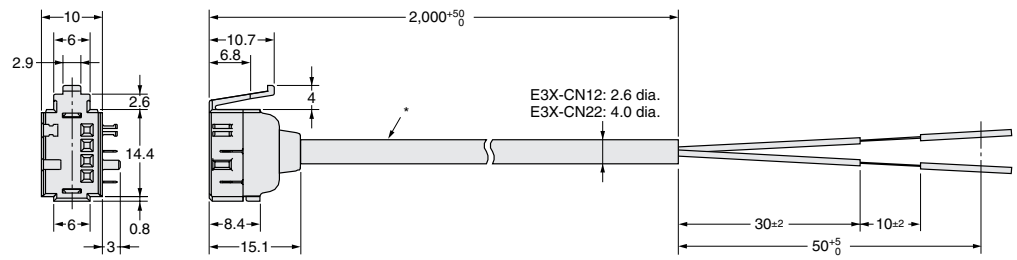
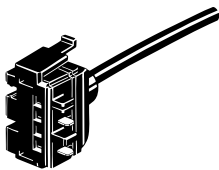
E3X-CN11
E3X-CN21



* E3X-CN11: A 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.
E3X-CN21: A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Slave connector

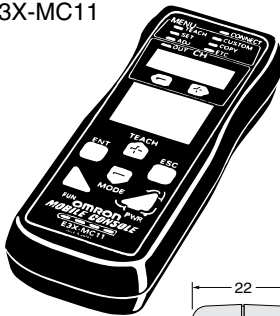
E3X-CN12
E3X-CN22



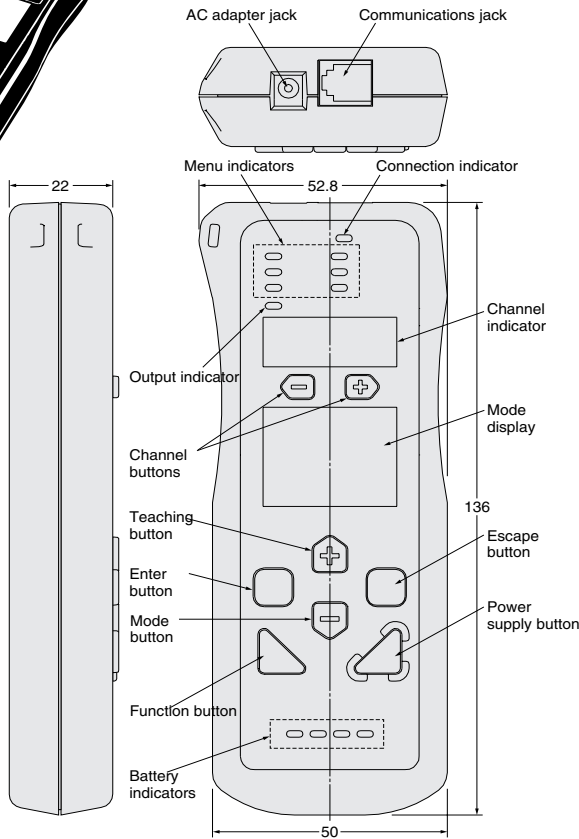
* E3X-CN12: A 2.6-dia., single-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.
E3X-CN22: A 4-dia., 2-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm) is used.

Mobile Console

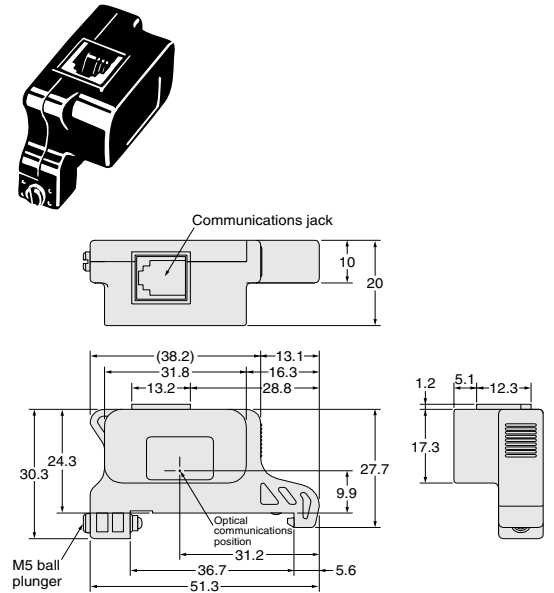
E3X-MC11



Mobile Console

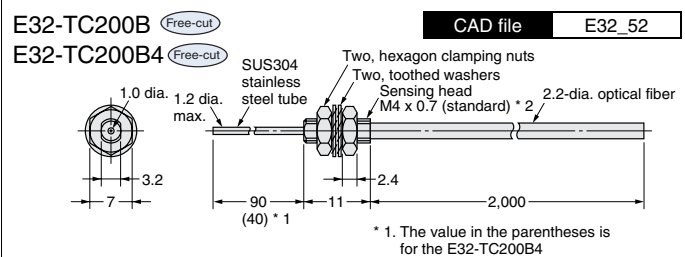
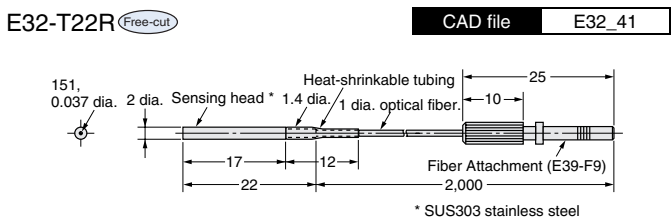
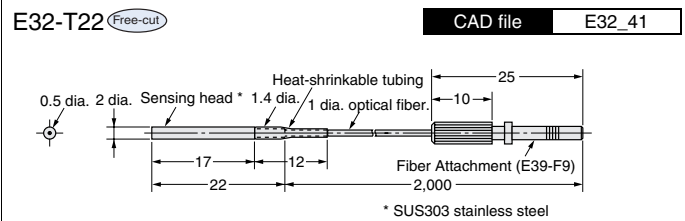
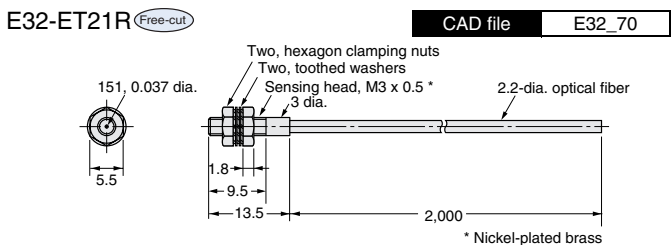
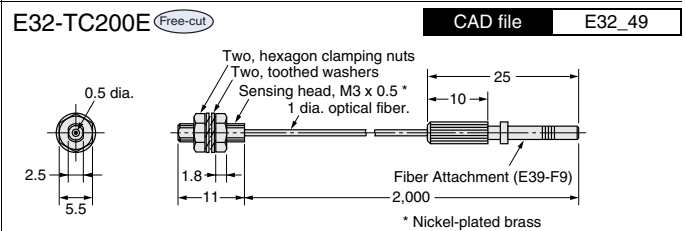
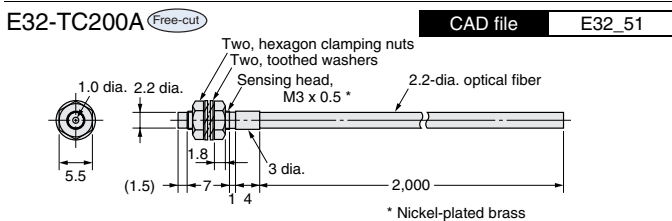
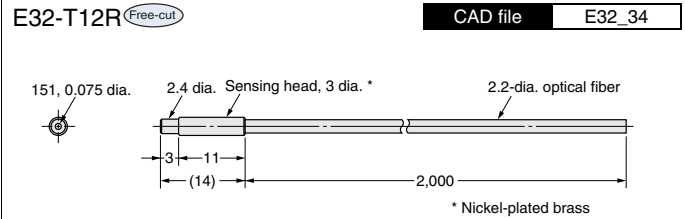
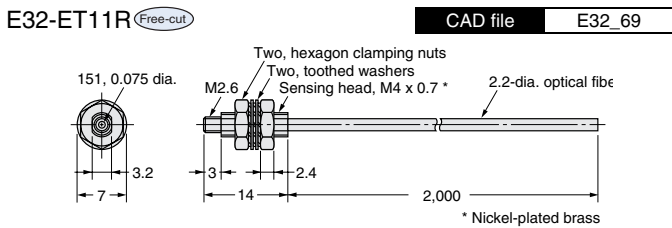
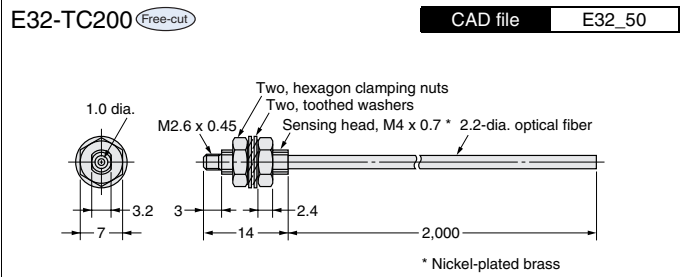
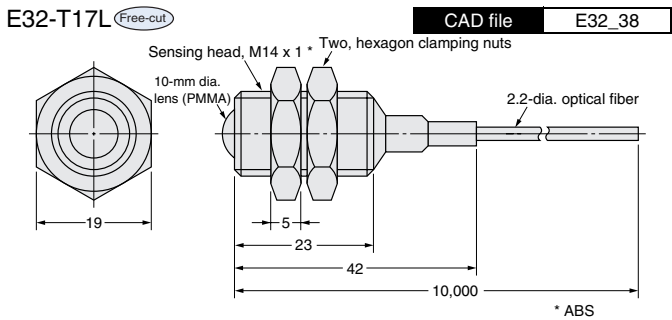
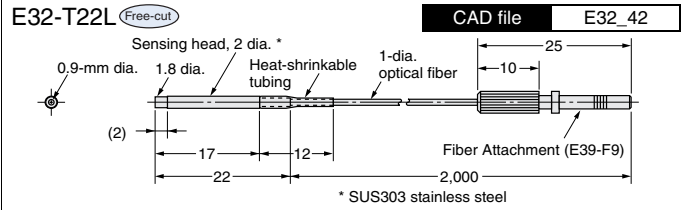
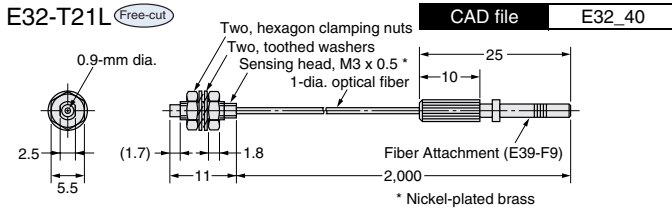
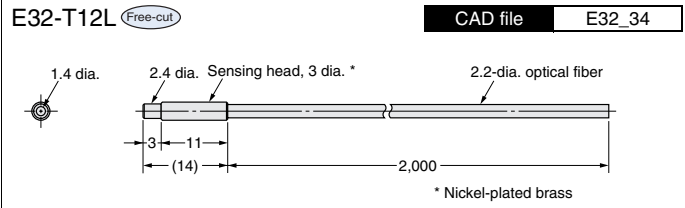
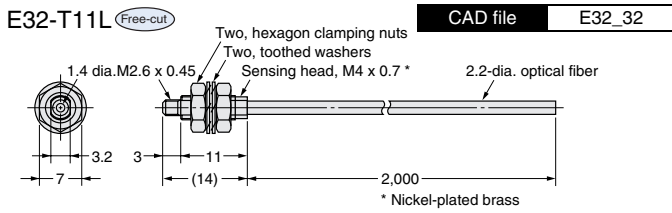


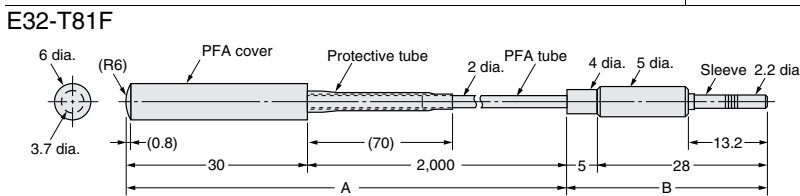
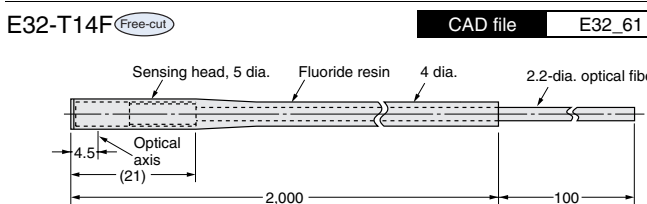
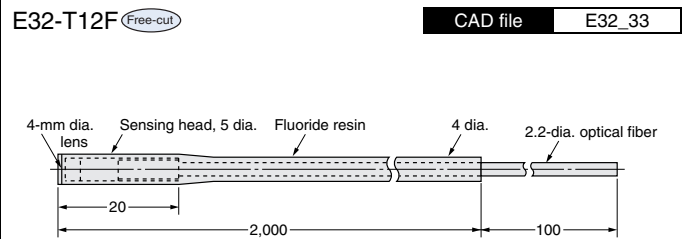
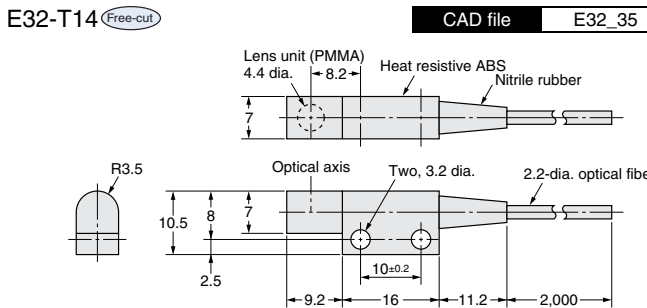
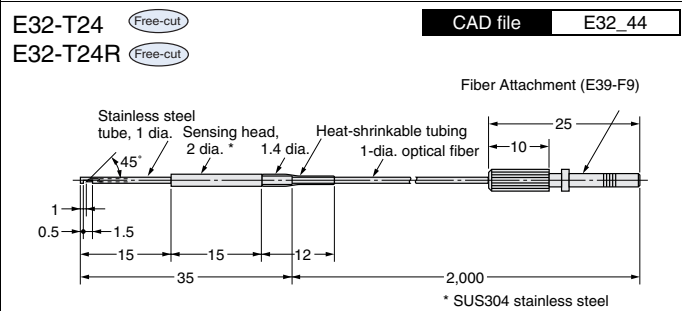
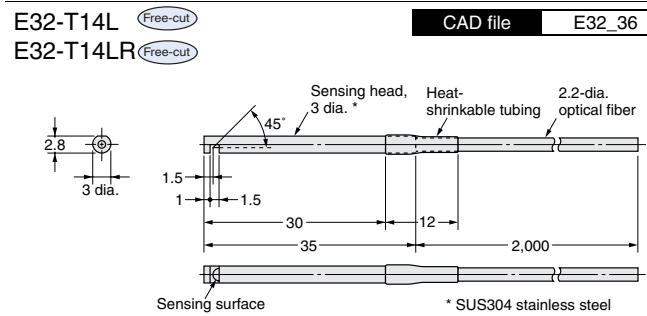
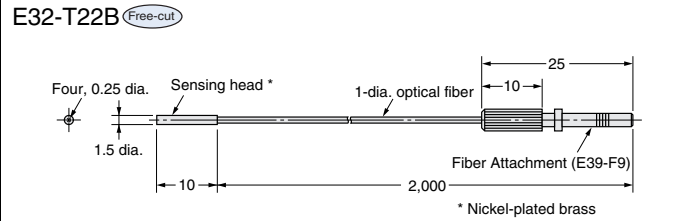
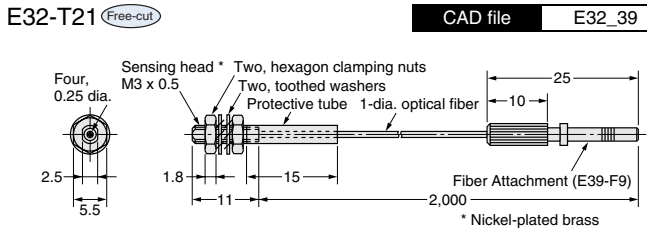
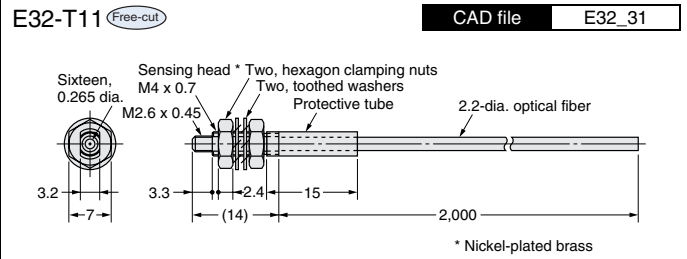
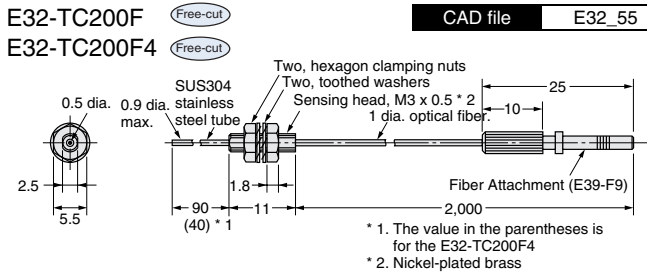
Mobile Console head



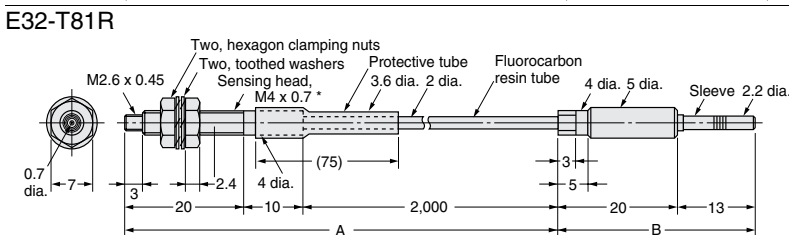
Fiber Units

Through-beam fiber unit (used in pairs) **Free-cut** indicates a fiber unit that can be cut freely.





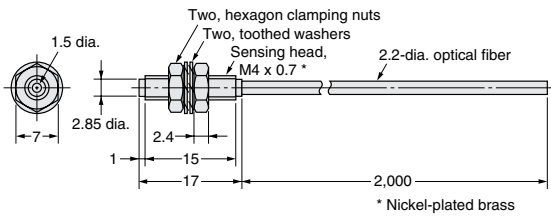
Note: Section A resists 200°C, section B resists 110°C.



* SUS303 stainless steel
 Note: Section A resists 200°C, section B resists 110°C.

E32-ET51 (Free-cut)

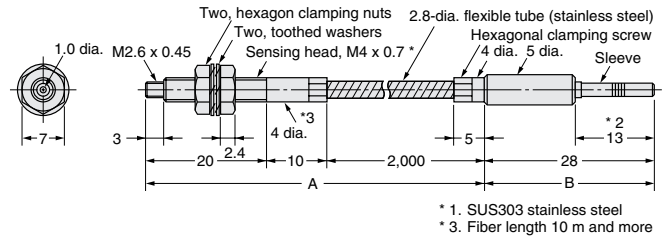
CAD file E32_46



Note: Resistant temperature is 150°C. Resistant temperature is 130°C when used continuously.

E32-T61

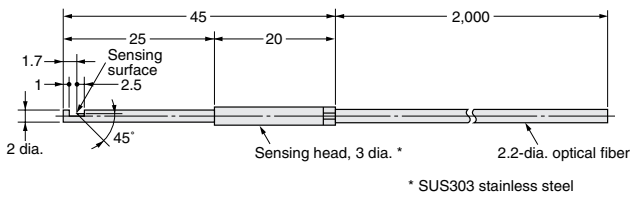
CAD file E32_47



Note: Section A resists 300°C and section B (which is inserted to the amplifier) resists 110°C. The operating temperature of section to be inserted into the sensor (marked with *) must be within the operating temperature range of the amplifier.

E32-T54 (Free-cut)

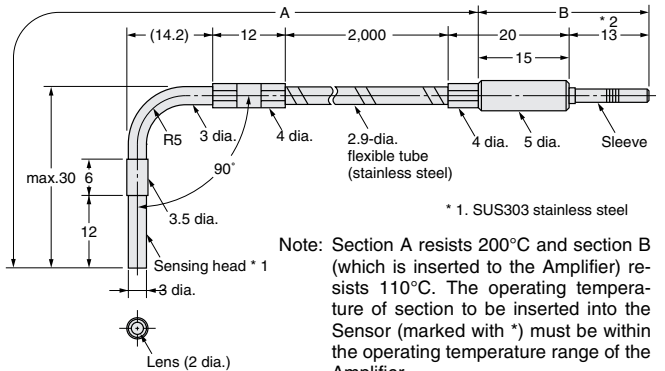
CAD file E32_63



Note: Resistant temperature is 150°C. Resistant temperature is 130°C when used continuously.

E32-T84S

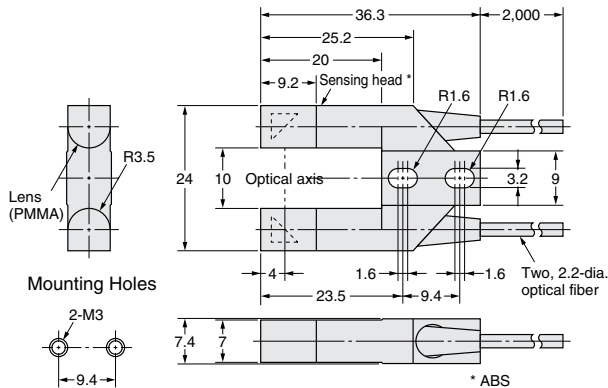
CAD file E32_48



Note: Section A resists 200°C and section B (which is inserted to the Amplifier) resists 110°C. The operating temperature of section to be inserted into the Sensor (marked with *) must be within the operating temperature range of the Amplifier.

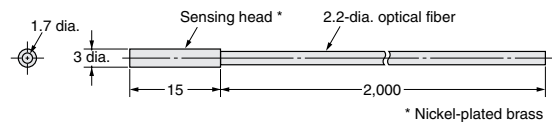
E32-G14 (Free-cut)

CAD file E32_24



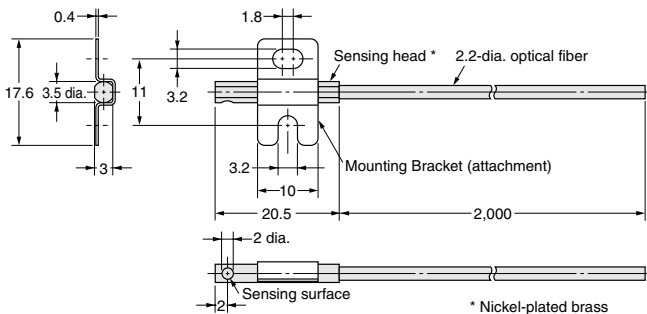
E32-T22S (Free-cut)

CAD file E32_43



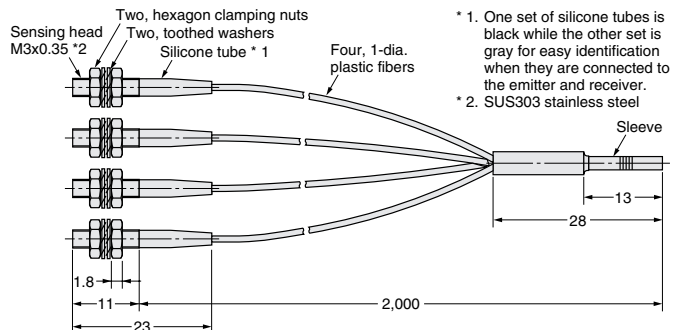
E32-T24S (Free-cut)

CAD file E32_45



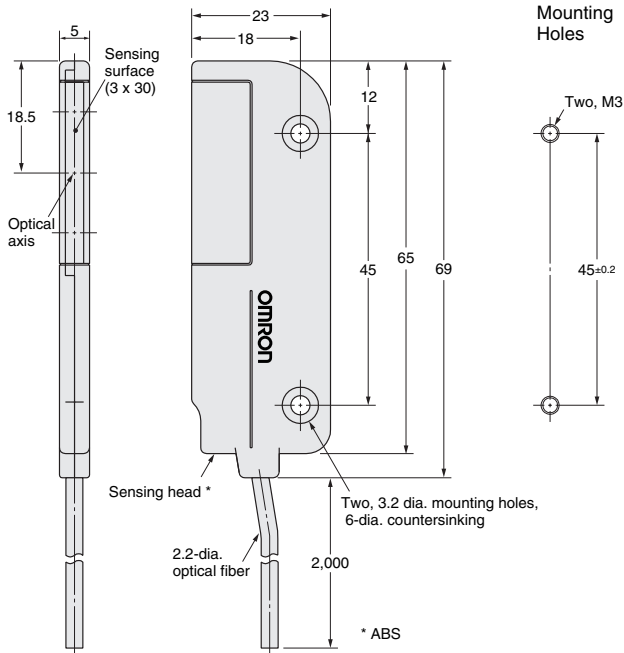
E32-M21

CAD file E32_28



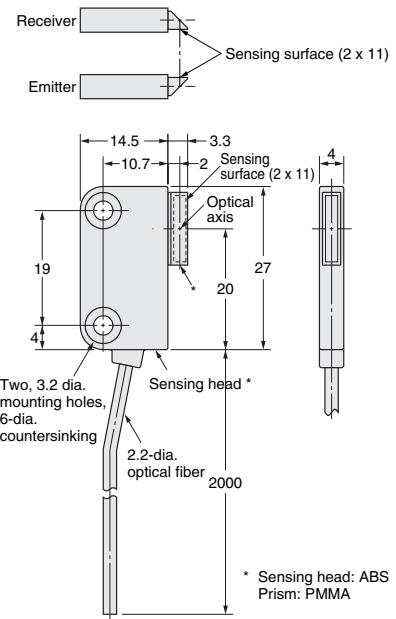
* 1. One set of silicone tubes is black while the other set is gray for easy identification when they are connected to the emitter and receiver.
* 2. SUS303 stainless steel

E32-T16W (Free-cut)
E32-T16WR (Free-cut)



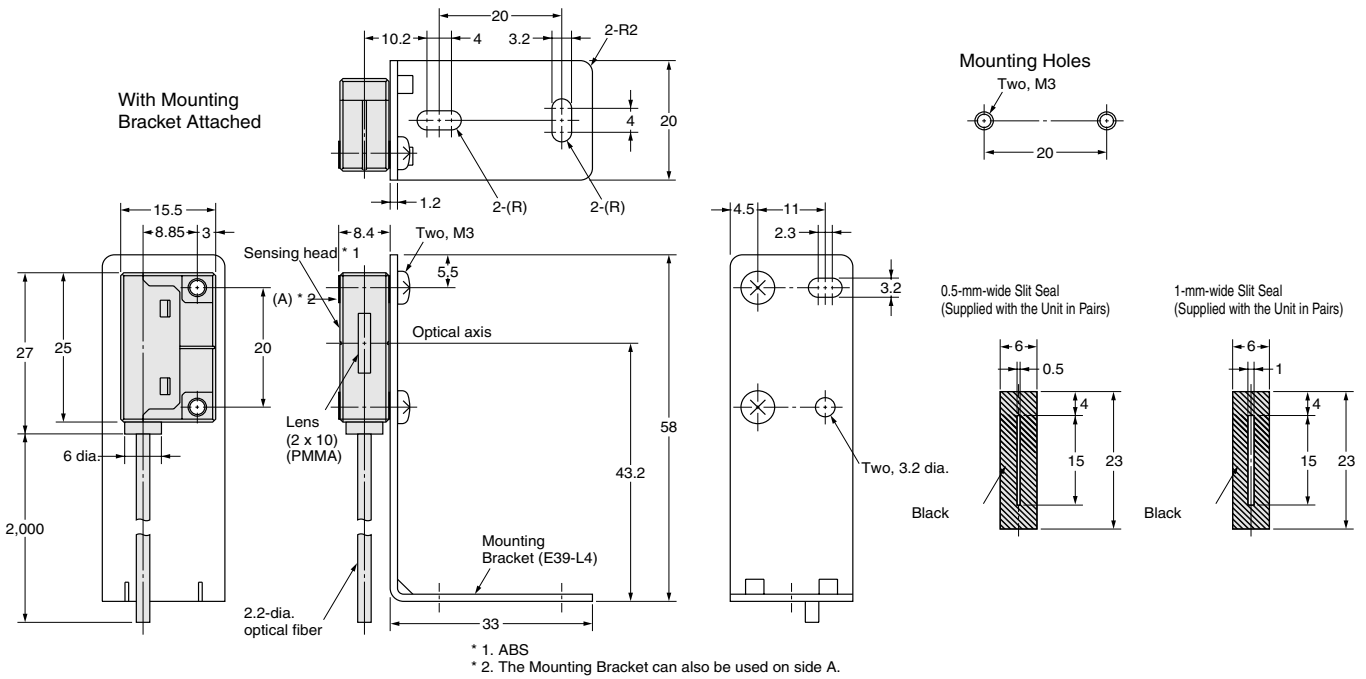
E32-T16J (Free-cut)
E32-T16JR (Free-cut)

CAD file E32_77



E32-T16 (Free-cut)

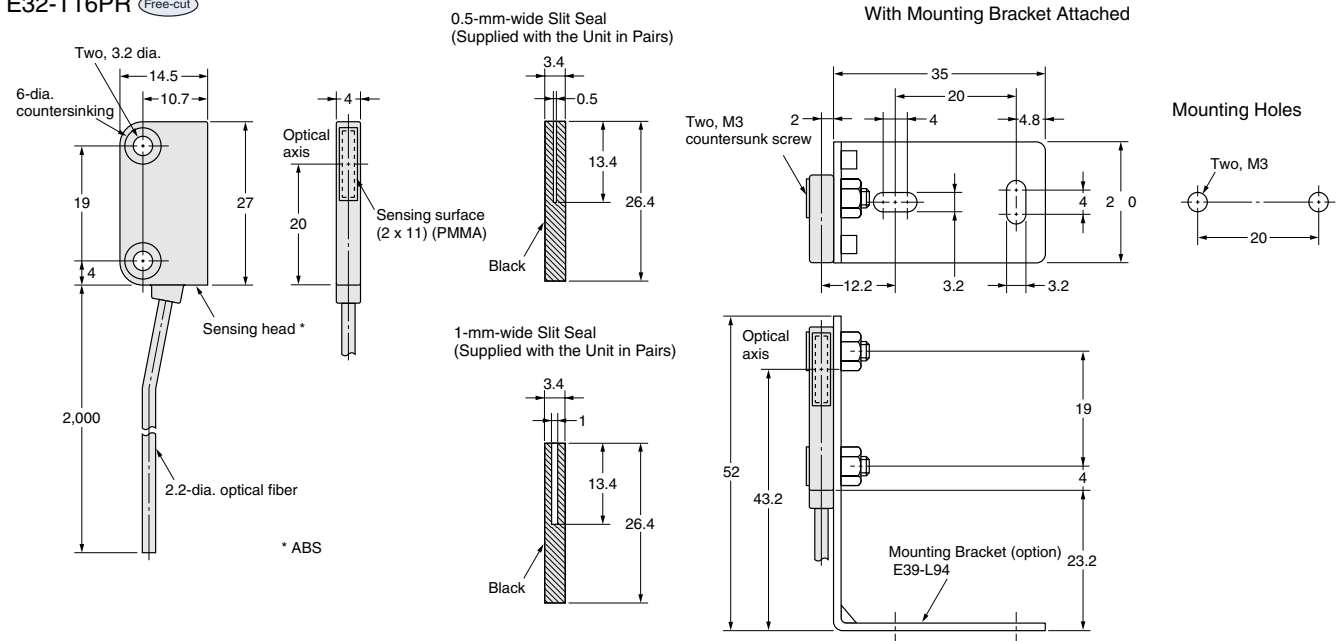
CAD file E32_37



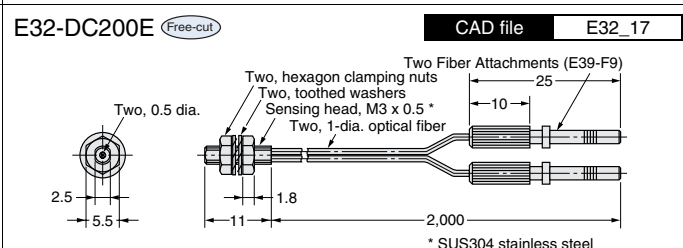
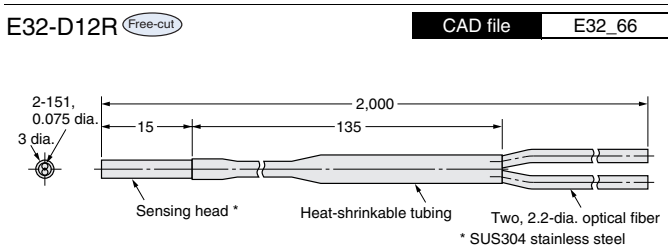
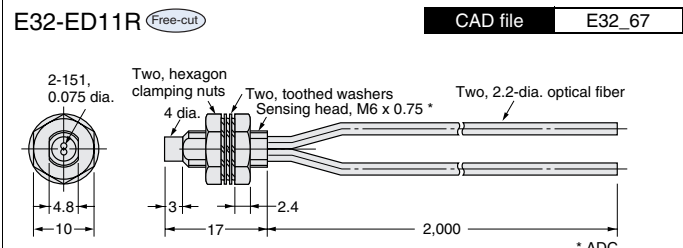
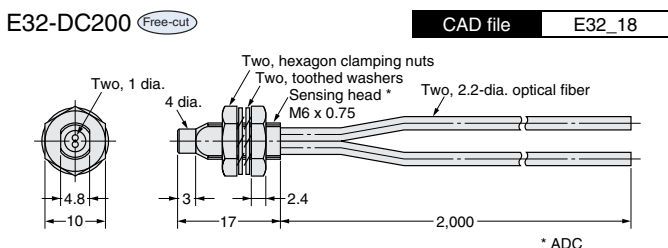
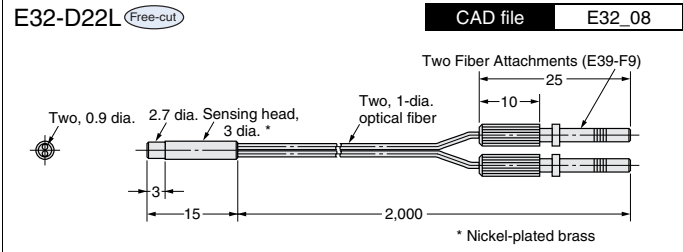
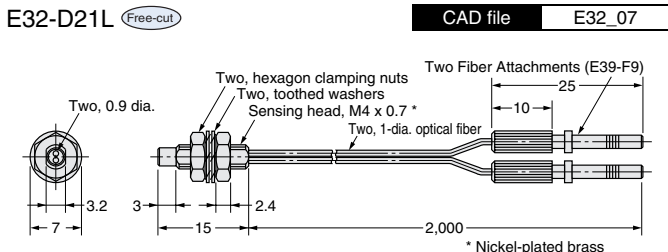
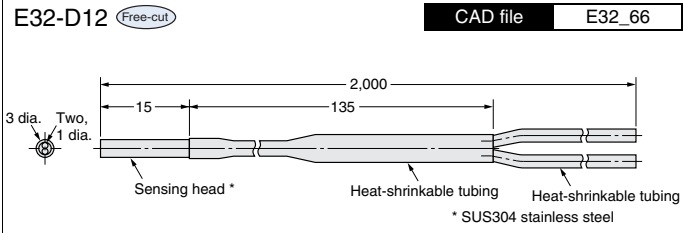
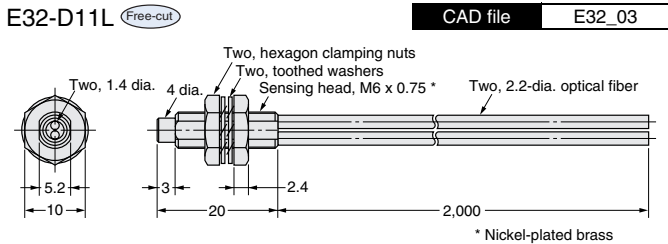
* 1. ABS
* 2. The Mounting Bracket can also be used on side A.

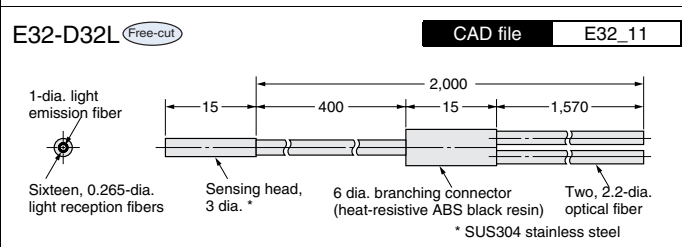
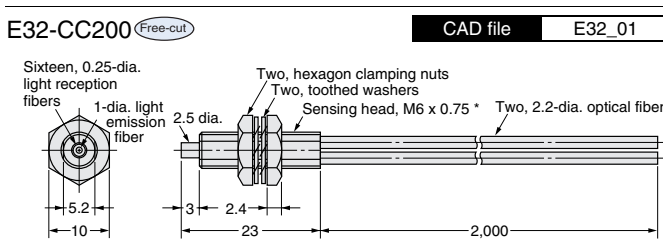
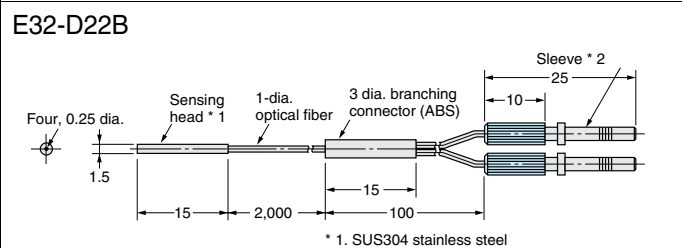
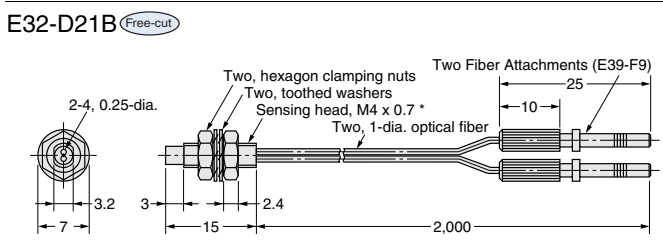
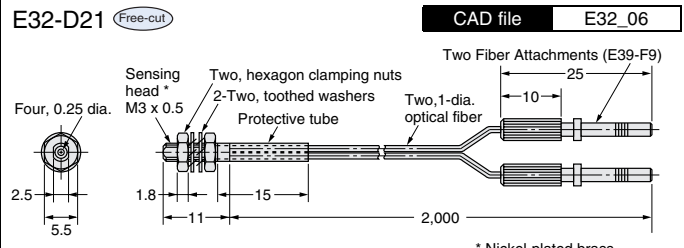
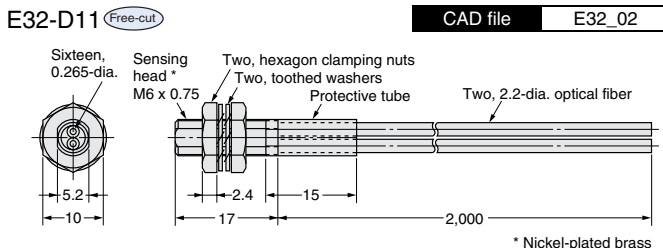
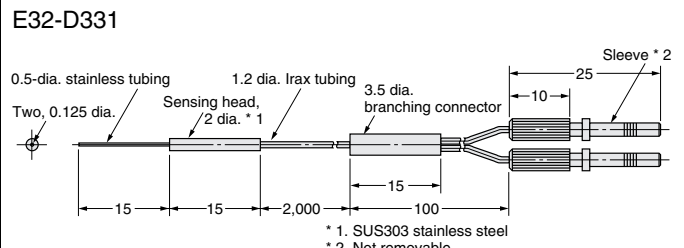
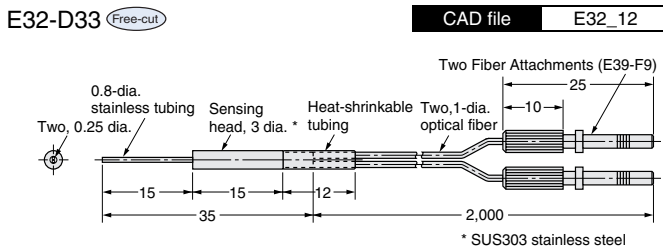
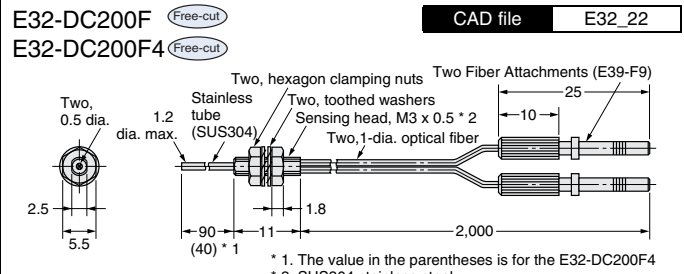
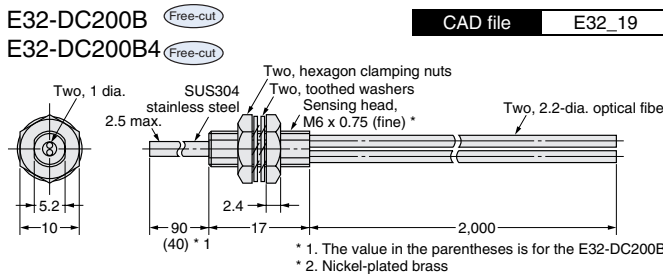
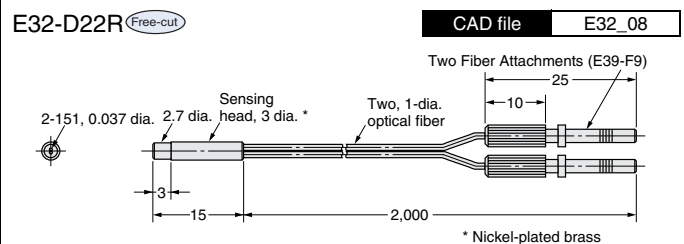
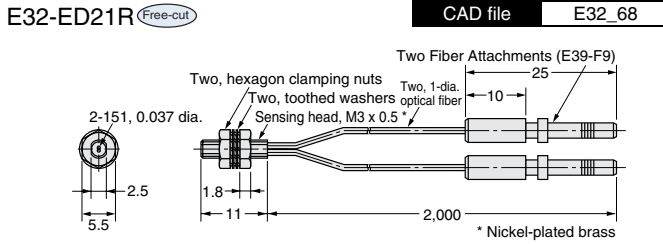
E32-T16P (Free-cut)
E32-T16PR (Free-cut)

CAD file E32_T01



Fiber Units with Reflective Sensor

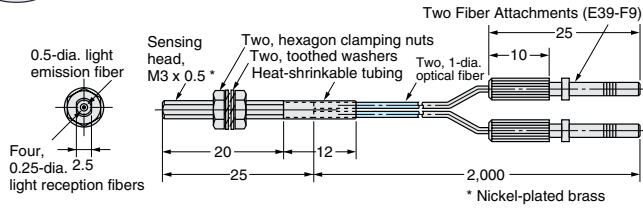




Note: The fiber for the emitter is identified by a white line.

Note: The fiber for the emitter is identified by a yellow dotted line.

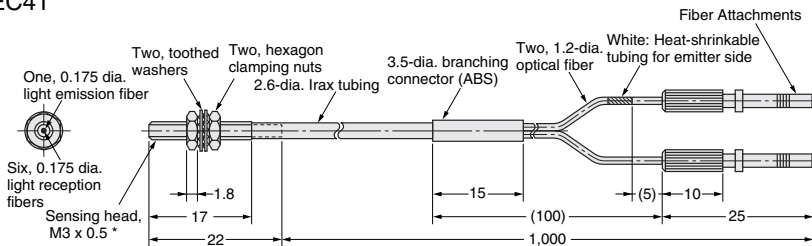
E32-EC31 (Free-cut)



Note: 1. The fiber for the emitter is identified by a white line.
2. The root diameter of the sensing head should be 2.44 to 2.49.

E32-EC41

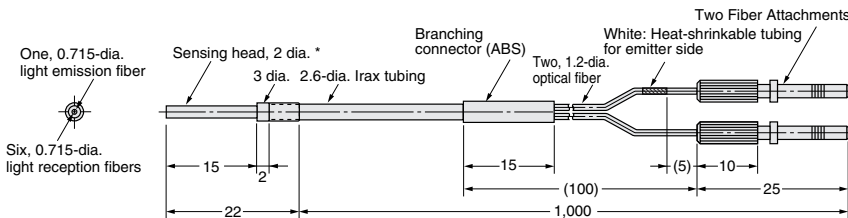
CAD file E32_80



* SUS303 stainless steel
Note: The fiber attachment is adhered and cannot be removed.

E32-C42

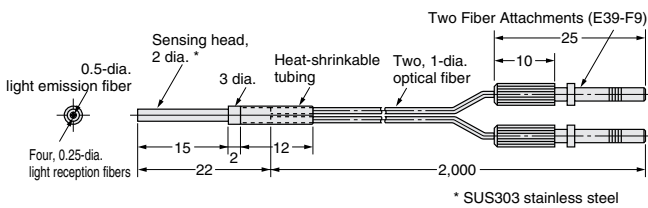
CAD file E32_81



* SUS303 stainless steel
Note: The fiber attachment is adhered and cannot be removed.

E32-D32 (Free-cut)

CAD file E32_10

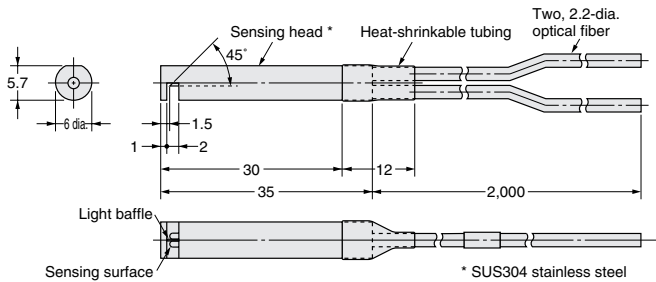


Note: The fiber for the emitter is identified by a white line.

E32-D14L (Free-cut)

CAD file E32_05

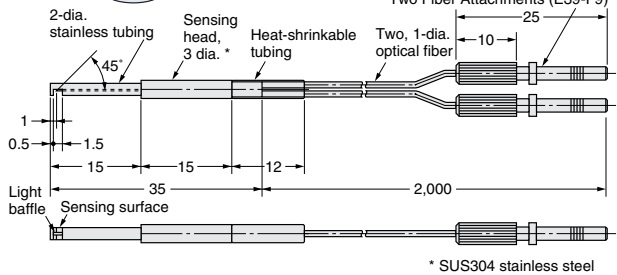
E32-D14LR (Free-cut)



E32-D24 (Free-cut)

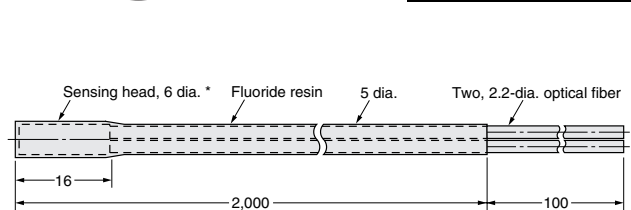
CAD file E32_09

E32-D24R (Free-cut)



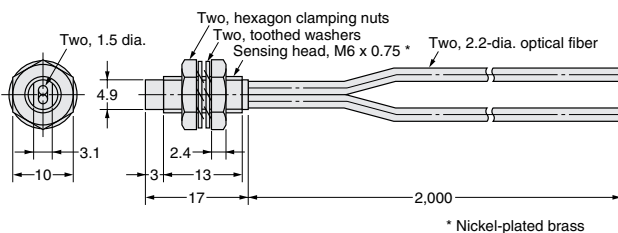
E32-D12F (Free-cut)

CAD file E32_04



E32-ED51 (Free-cut)

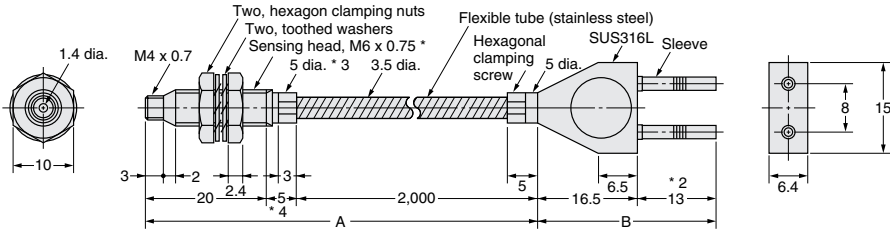
CAD file E32_13



Note: Resistant temperature is 150°C.
Resistant temperature is 130°C when used continuously.

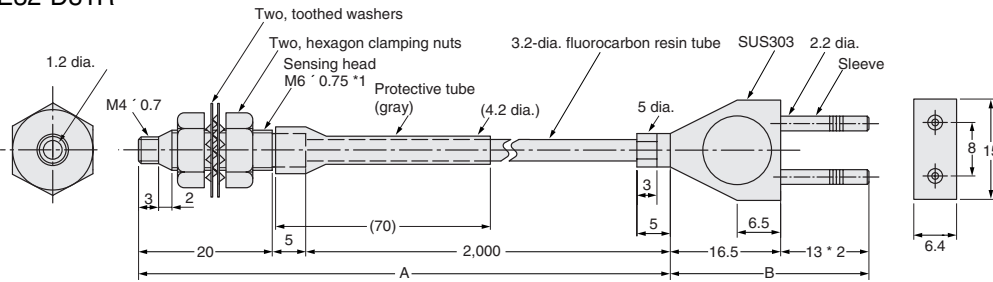
E32-D61

CAD file E32_14



* 1. SUS303 stainless steel
 * 3. Fiber length 10 m and more becomes 6-dia
 * 4. Fiber length 10 m and more becomes 10-dia
 Note: Section A resists 300°C and section B (which is inserted to the Amplifier) resists 110°C. The operating temperature of section to be inserted into the Sensor (marked with *) must be within the operating temperature range of the Amplifier.

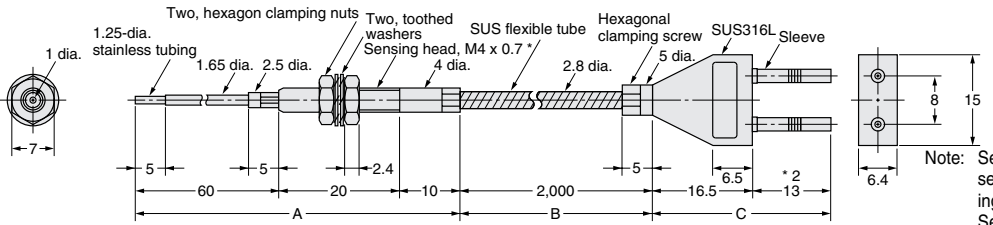
E32-D81R



* 1. SUS303 stainless steel
 Note: Section A resists 200°C and section B (which is inserted to the Amplifier) resists 110°C. The operating temperature of section to be inserted into the Sensor (marked with *) must be within the operating temperature range of the Amplifier.

E32-D73

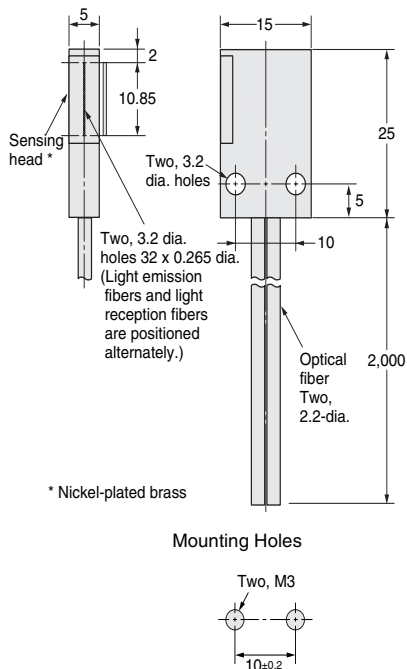
CAD file E32_15



* 1. SUS303 stainless steel
 Note: Section A resists 400°C and section B (which is inserted to the Amplifier) resists 110°C. The operating temperature of section to be inserted into the Sensor (marked with *) must be within the operating temperature range of the Amplifier.

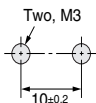
E32-D36P1 (Free-cut)

CAD file E32_78



* Nickel-plated brass

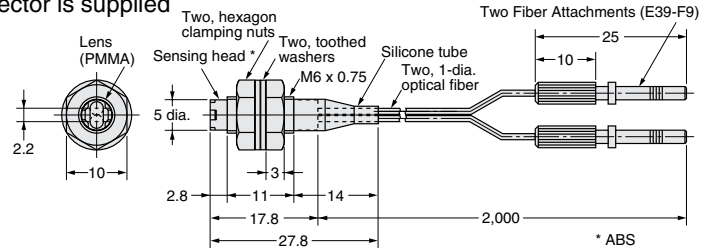
Mounting Holes



E32-R21 (Free-cut)

(One E39-R3 Reflector is supplied with the sensor)

CAD file E32_30

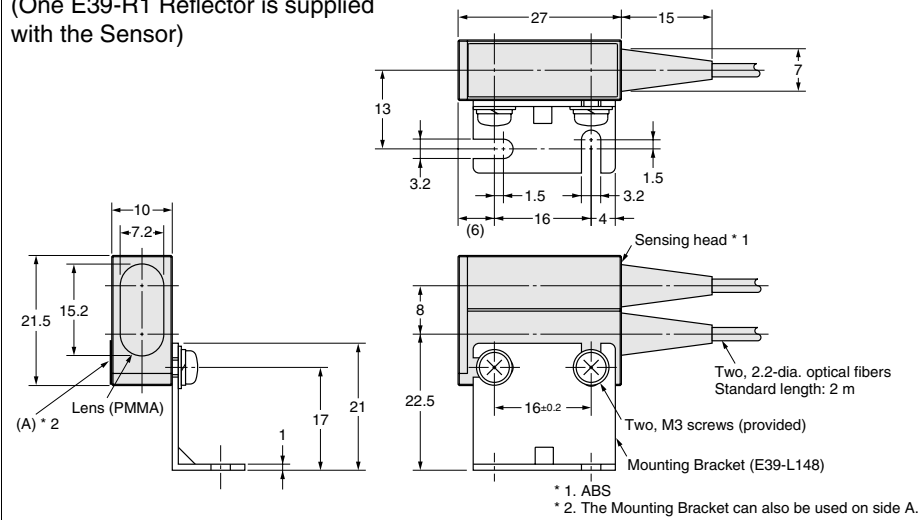


* ABS

E32-R16 (Free-cut)

(One E39-R1 Reflector is supplied with the Sensor)

CAD file E32_29



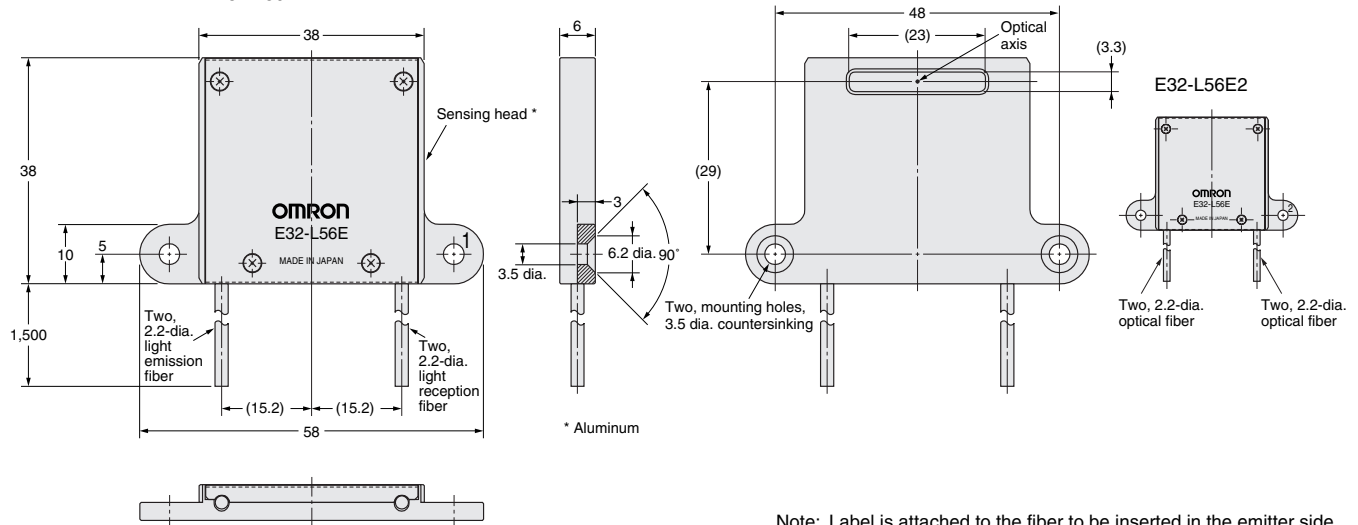
* 1. ABS
 * 2. The Mounting Bracket can also be used on side A.

E32-L56E1 (Free-cut)

CAD file E32_76

E32-L56E2 (Free-cut)

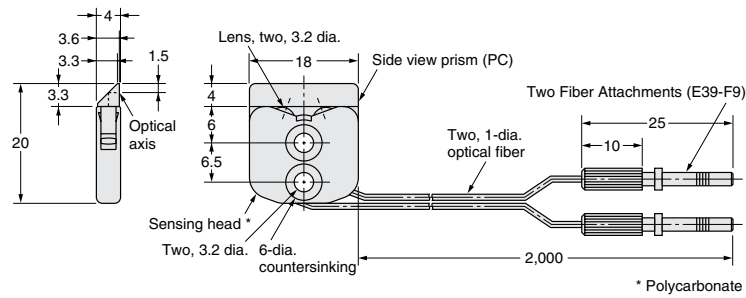
E32-L56E1



Note: Label is attached to the fiber to be inserted in the emitter side.

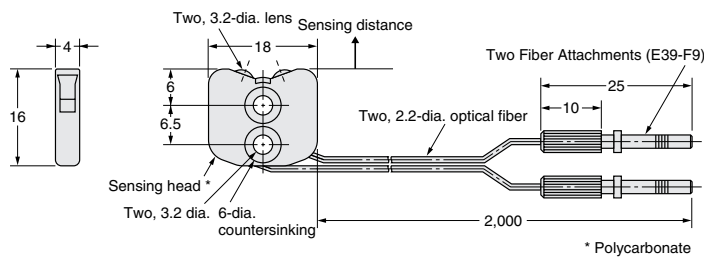
E32-L24L (Free-cut)

CAD file E32_L01



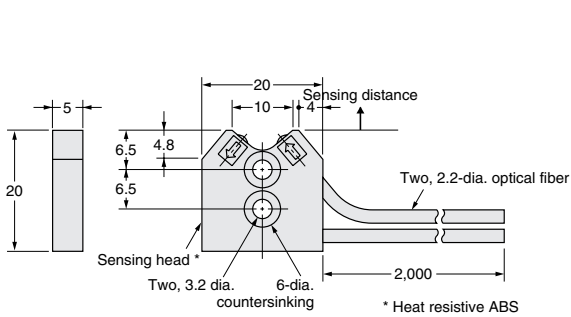
E32-L25L (Free-cut)

CAD file E32_L02



E32-L25L (Free-cut)

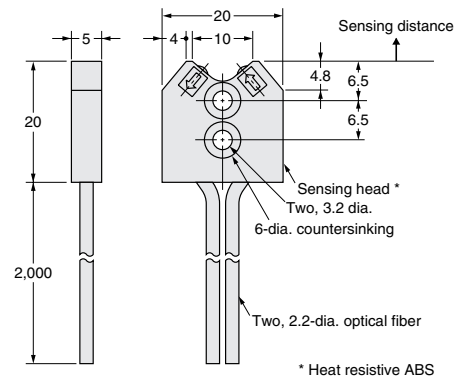
CAD file E32_25



Note: The fiber for the emitter is identified by a white line.

E32-L25A (Free-cut)

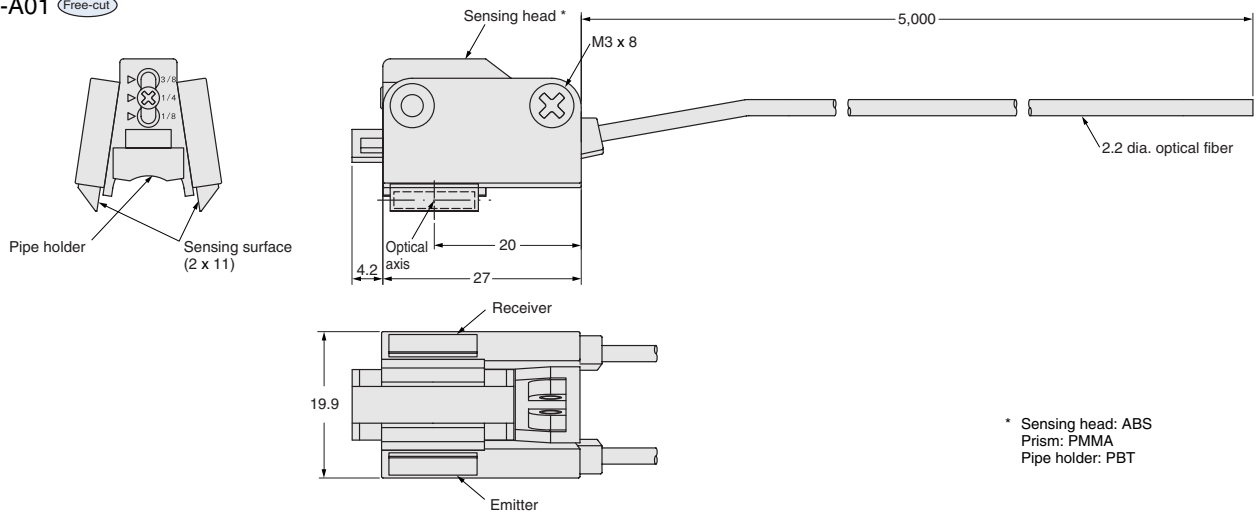
CAD file E32_26



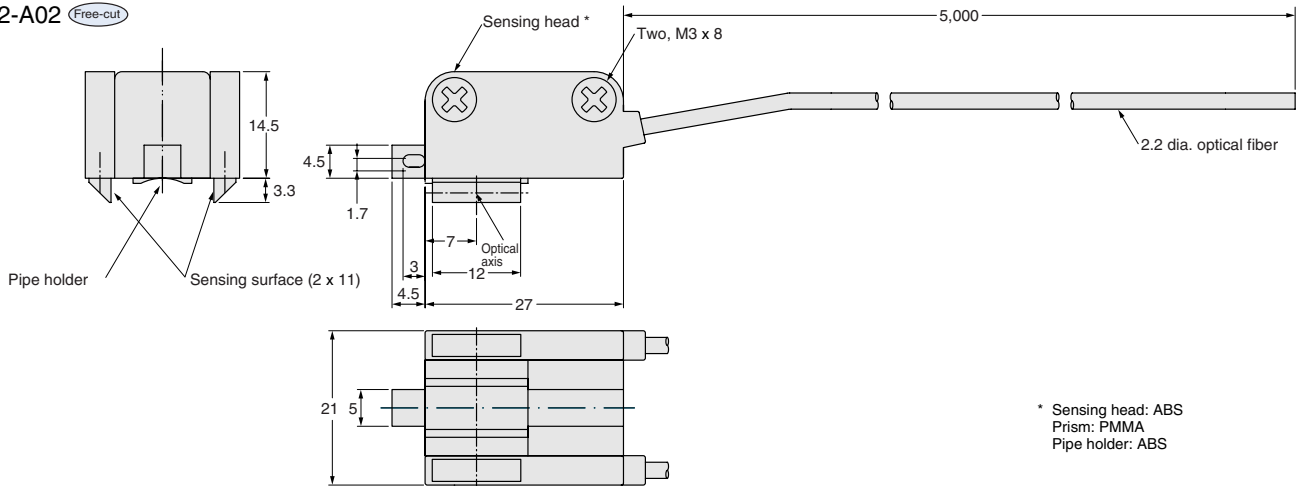
Note: The fiber for the emitter is identified by a white line.

Fluid level Detection

E32-A01 (Free-cut)

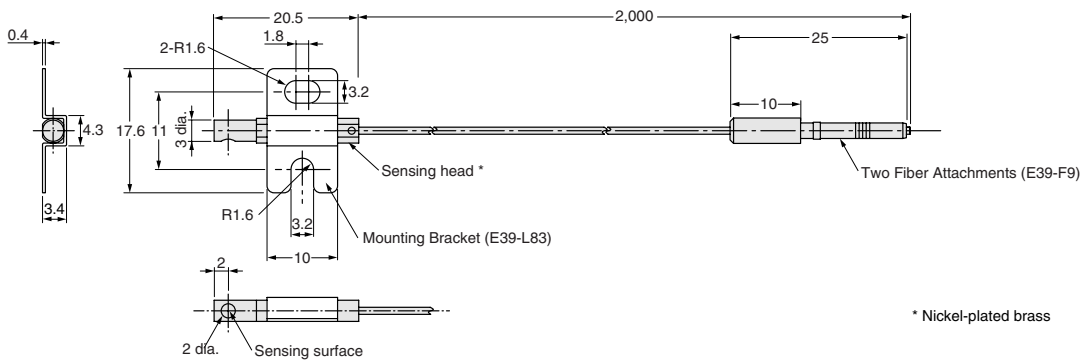


E32-A02 (Free-cut)

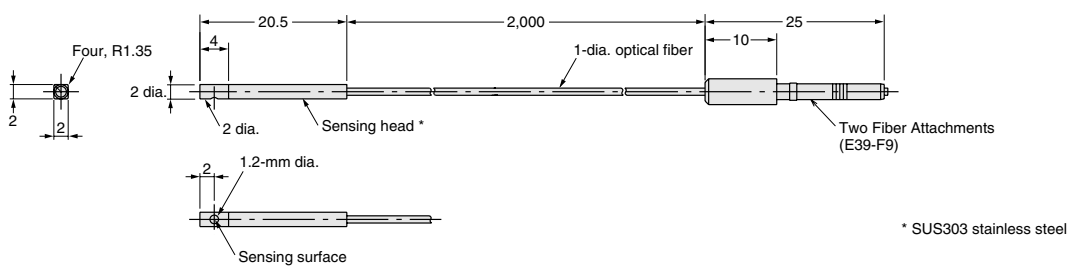


Through-beam Mapping Sensor

E32-A03 (Free-cut)



E32-A04 (Free-cut)



Accessories (Order Separately)

- [Reflectors A-314](#)
- [Mounting Brackets A-314](#)
- [End Plate](#)
- [PFP-M](#)

Lens Unit

E39-F1 Long Distance Lens Units CAD file E39_01

M2.6 x 0.45
Effective depth: 3.8
Countersunk with straight edge, depth: 0.9

Material: Tube: Brass Lens: Optical glass
Note: One set includes two units

E39-F2 side view unit E39-F2 CAD file E39_02

M2.6
Effective depth: 3.2
Countersunk with straight edge, depth: 0.9

Material: Tube: Brass Lens: Optical glass
Note: One set includes two units

Lens-equipped Reflective Unit E39-F3 CAD file E39_03

Two, 4 dia. M3 toothed washers
Two, 3.2 dia. M3 x 3 slotted head machine screws *
M3 x 6 angle fixing screws

Material: Tube: Brass Base: Aluminum
* Fix the fiber head using the slotted head machines screw. Do not insert the E39-F1 Lens.

E39-F5 side view Reflective Unit CAD file E39_08

Two, 3.2 dia. sensing holes
Two, 3.2 dia. mounting holes
Two, M3 Fiber Unit mounting holes (E32-TC200A)

Material: Base: Brass Reflector Stainless steel
Note: Only the E32-TC200A can be mounted. When mounting it, remove all the supplied nuts and screw it into the E39-F5. (Screw it until it is stopped by the stopper.)

Small Spot Lens Unit E39-F3A CAD file E39_07

M2 x 2 hexagon set screw (for fixing fibers)

Material: Tube: Aluminum
Optical lens: Optical glass
Note: E32-D32 is a Lens Unit for the E32-C42.

Small Spot Lens Unit E39-F3A-5 CAD file E39_44

Flat knurled nut
M3 x 0.5, effective length: 3

Material: Tube: Aluminum
Optical lens: Optical glass
Note: E32-C31 is a Lens Unit for the E32-C41.

Small Spot Lens Unit E39-F3B CAD file E39_45

M3 x 0.5, depth: 4.4

Material: Tube: Aluminum
Optical lens: Optical glass
Note: E32-C31 is a Lens Unit for the E32-C41.

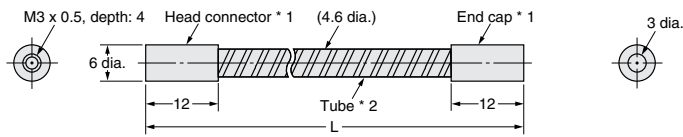
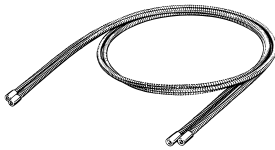
Small Spot Lens Unit E39-F3C CAD file E39_46

Flat knurled nut
M3 x 0.5, effective length: 3

Material: Tube: Aluminum
Optical lens: Optical glass
Note: E32-C31 is a Lens Unit for the E32-C41.

Protective Spiral Tubes

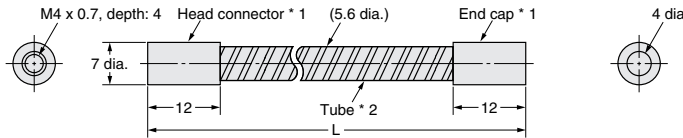
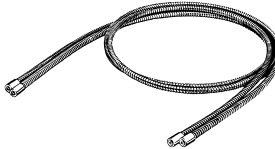
E39-F32A/F32A5
E39-F32B/F32B5



* 1. Nickel-plated brass
* 2. SUS304 stainless-steel

Note: 1 . L is as follows: E39-F32A and E39-F32B: 1,000 E39-F32A5, E39-F32B5: 500
2 . A pair of E39-F32A (5)'s is sold as E39-F32B (5)

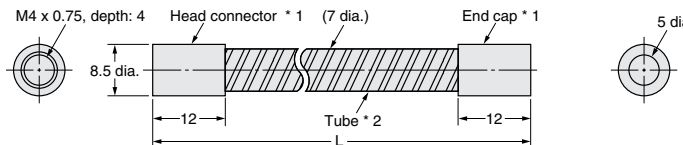
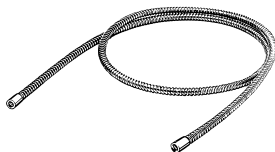
E39-F32C, F32C5



* 1. Nickel-plated brass
* 2. SUS304 stainless-steel

Note: L is as follows: E39-F32C: 1,000, E39-F32C5: 500

E39-F32D/F32D5

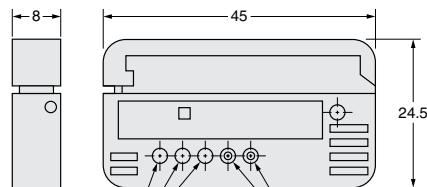
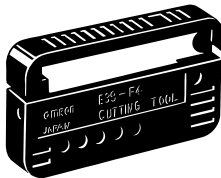


* 1. Nickel-plated brass
* 2. SUS304 stainless-steel

Note: L is as follows: E39-F32D: 1,000 E39-F32A5, E39-F32D5: 500

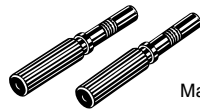
Other Accessories

E39-F4 Fiber Cutter



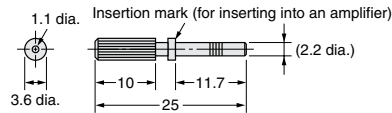
Standard fiber insertion hole Thin fiber insertion hole

E39-F9 Attachment for Thin Fiber



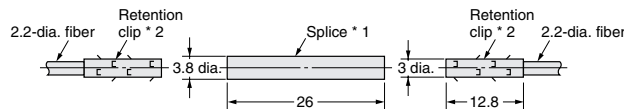
Material: ABS

Note: One set includes two units.
Included with Thin Fiber Unit.



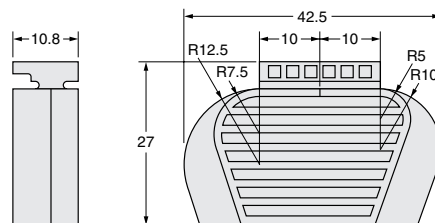
CAD file E39_09

E39-F10 Fiber Connector



* 1. Polyester
* 2. Brass

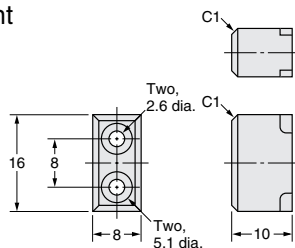
E39-F11 Sleeve Bender



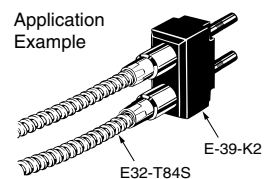
E39-K2 Protective Attachment



Material: ABS



Application Example



Communication unit for fiber amplifier

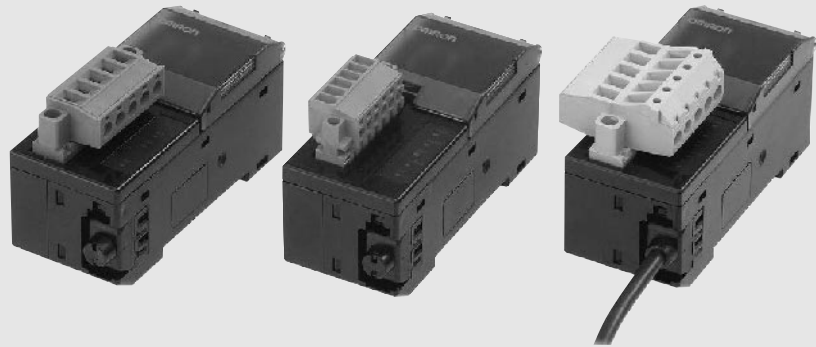
E3X-DRT21/SRT21/CIF11

Three communication units unveiled

E3X-DRT21 for
DeviceNet

E3X-SRT21 for
CompoBus/S

E3X-CIF11 for
RS422



NEW

Features

Reduced Wiring
New connectors enable wiring and space reductions, as well as easier maintenance.

Create the Required Number of Channels by Connecting Up To 16 Units (14 Units for CompoBus/S).

A New Amplifier That Monitors the ON/OFF
The peak data and bottom data are updated according to the ON/OFF timing of the Sensor. (One is updated when the Sensor turns ON, and the other when the Sensor turns OFF, depending on whether the Sensor is light-ON or dark-ON.) This feature enables monitoring of aging and remote setting of thresholds, even in applications with a high ON/OFF frequency.

Wiring-reduction Connector
E3X-CN02

Terminal-block E39-TM1
Using a Terminal-block Unit allows input from microswitches.

Mobile Console
Connecting a hand-held Mobile Console enables easy setting and monitoring.

Optical communications

Fibers

DeviceNet

RS422

Programmable controller

Microswitch

E3X-DA6-P

Incident level data
Threshold value

Bottom data

Peak data

Ordering Information

Communication unit

Communication system	Model
For DeviceNet	E3X-DRT21
For CompoBus/S	E3X-SRT21
For RS422	E3X-CIF11

Terminal block unit

Communication system	Model
General	E39-TM1

Fiber amplifier (with incident level monitoring function)

Communication system	Model
General	E3X-DA6-P

Amplifier Unit Connectors

Communication system	Model
---	E3X-CN02

* Please order the fiber amplifier and wiring-saving connector as a set.

Rating/performance

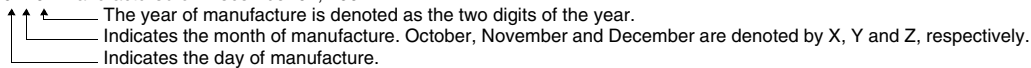
Communication unit

Item	Model	E3X-DRT21	E3X-SRT21	E3X-CIF11
Communication system		DeviceNet	CompoBus/S	RS422
Connectable fiber amplifier *1		*2E3X-DA6, E3X-DA8, E3X-DAB6, E3X-DAB8, E3X-DAG6, E3X-DAG8 E3X-DA6TW, E3X-DA8TW, E3X-DA6-P, E39-TM1		
Number of connectable fiber amplifiers		16 max.	14 max.	16 max.
Supply voltage		11 to 25 VDC	14 to 26.4 VDC	11.4 to 26.4 VDC (12 VDC -5% to 24 VDC +10%)
Internal current consumption *3		70 mA max.	30 mA max.	40 mA max.
Ambient temperature		Operating: -20°C to 55°C, storage: -30°C to 70°C (with no icing or condensation)		
Ambient humidity		35% to 85%RH (with no condensation)		
Weight (Packed state)		Approx. 150 g		Approx. 200 g

*1. Connection is not supported for Amplifiers Units cables (e.g., E3X-DA11-N) and water-resistant Amplifiers Units (e.g., E3X-DA11V).

*2. Can be connected with only the product of the following lot number or later.

Lot No. 01Z01 Manufactured on December 01, 2001.



*3. Does not include the current supplied to the fiber amplifier.

Terminal block unit

Item	Model	E39-TM1
Supply voltage *1		12 to 24 VDC ±10%, ripple (p-p) : 10% max.
Power supply for sensor		11 to 23 VDC (supply voltage -1 V)
Current consumption		40 mA max. + used sensor's current consumption (total max. 100 mA)
Response speed		1.2 ms max.
Number of input points		1 point
Input signal		NPN/PNP no-voltage input (contact and non-contact), switchable
Input operation form		N.O/N.C. switch selection
Indicator lamp		Input signal display (orange)
Ambient temperature *2		Operating: Groups of 1 to 3 units: -25 to +55°C (with no icing or condensation) Groups of 4 to 8 units: -25 to +45°C (with no icing or condensation) Groups of 9 to 16 units: -25 to +40°C (with no icing or condensation) Storage: -30°C to 70°C

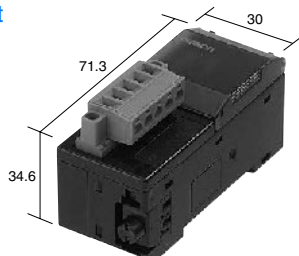
*1. Power to the E39-TM1 is supplied from the communication unit (option). Use the connector E3X-CN02 (option).

*2. When 4 or more units are connected, the total current consumption of each unit should be 75 mA max. For use with the E3X-DA-N series, connect the E39-TM1 at the end. At this time, the upper limit of the ambient temperature of the E3X-DA-N series should be -5°C of the rating.

Dimensions (Unit: mm)

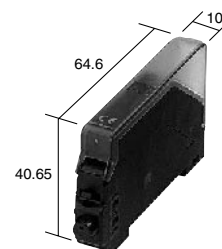
Communication unit

E3X-DRT21
E3X-SRT21
E3X-CIF11



Terminal block unit

E39-TM1



For the operating instructions and other details, read the user's manual. (Catalog No.: SCEA-800)

Super Manual Fiber Amplifier

E3X-NA

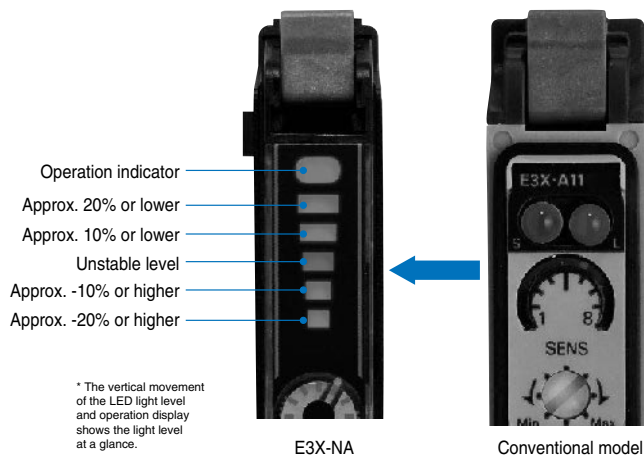
Adjuster type standard that is the culmination of true ease and simplicity



Features

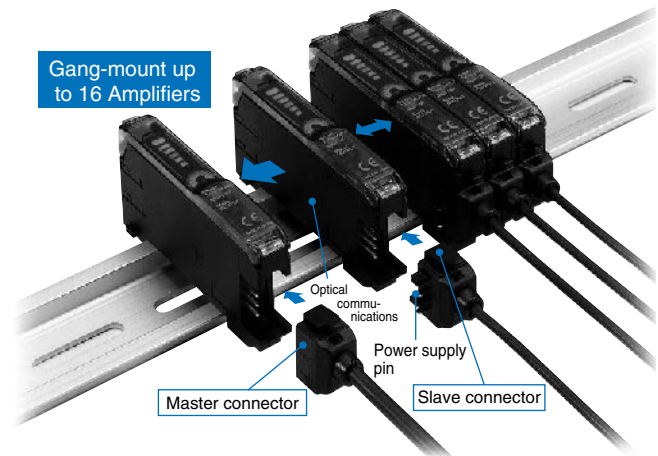
Instinctive LED bar displays of light levels

The previous manual type used the stability and incident level indicators to display the light level change, which was difficult to understand at a glance. The E3X-NA uses the LED bars to display the light level, ensuring the light level change at a glance.



Same "Wire-saving" Connector as E3X-DA-N

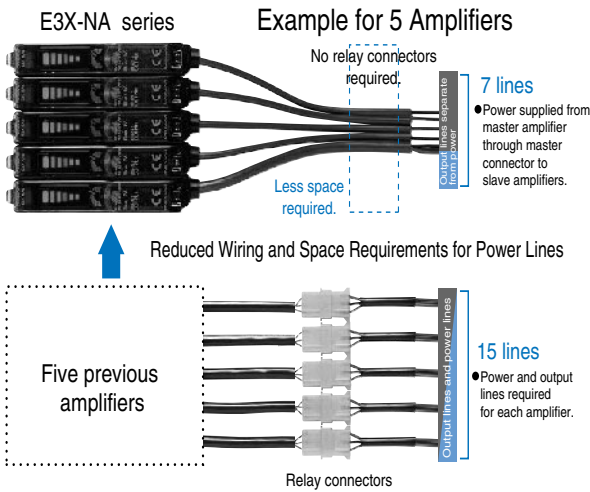
OMRON's original wiring-saving connector, which was inherited from the digital fiber amplifier E3X-DA-N, allows connection of up to 16 units.



Features

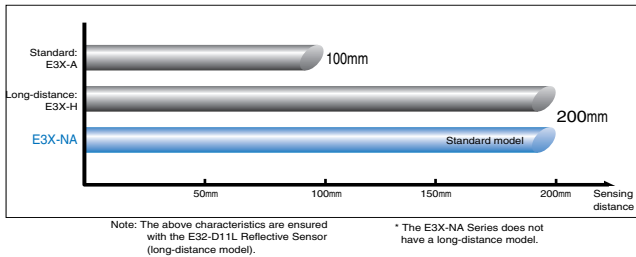
Reduced wiring and space requirements for power lines

Example for 5 Amplifiers E3X-NA Series



Same Sensing Distance as Previous Long-distance Models

200 mm Reflective Models



Approximately Seven Times the Detection Accuracy

Applied Fiber: E32-T16P (screen fiber) set at 100 mm. E3X-A1 1 (previous model) Minimum detection object: 2.0 mm dia. E3X-NA 0.3 mm dia.

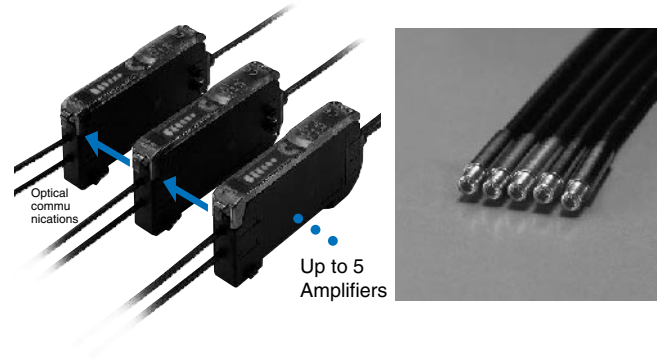
Applied Fiber: E32-T16 (screen fiber) set at 100 mm.

Minimum detection object: E3X-A11 (previous model) **2.0 mm dia.** **7 times** **0.3 mm dia.** E3X-NA

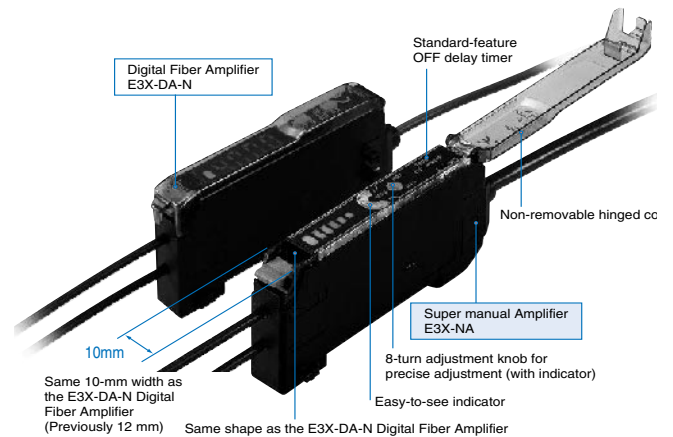
Addition of high-speed type and waterproof type to the series **NEW**

Optical Communications to Prevent Mutual Interference

Optical communication between amplifiers prevents mutual interference. Up to 5 fiber heads can be installed closely, except E3X-NA□F.



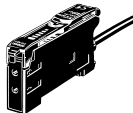
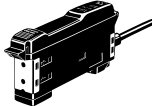
Dimensions and Designs Inherited from the E3X-DA-N Digital Fiber Amplifier





Ordering Information

Amplifier Units



Pre-wired

Item	Shape	Control output	Model	
			NPN output	PNP output
Standard models		ON/OFF output	E3X-NA11	E3X-NA41
High-speed detection			E3X-NA11F NEW	E3X-NA41F NEW
Mark-detecting models			E3X-NAG11	E3X-NAG41
Water-resistant models			E3X-NA11V NEW	E3X-NA41V NEW

Connector type

Item	Shape	Applicable Connector (order separately)		Control output	Model	
		Master	Slave		NPN output	PNP output
Standard models		Master	E3X-CN11	ON/OFF output	E3X-NA6	E3X-NA8
		Slave	E3X-CN12			
Water-resistant models (M8 Connector)		XS3F-M421-40□-A XS3F-M422-40□-A			E3X-NA14V NEW	E3X-NA44V NEW

Amplifier Units Connectors (Order Separately) Note: Stickers for Connectors are included as accessories.

Item	Shape	Cable length	No. of conductors	Model
Master connector		2 m	3	E3X-CN11
Slave connector			1	E3X-CN12



Precautions for ordering the connector type
Refer to the following tables when placing an order. Basically, Amplifier Units and connectors are sold separately.
Please place an order after referring to the combination given below.

Amplifier Units			Applicable Connector (order separately)	
Type	NPN	PNP	Master connector	Slave connector
Standard	E3X-NA6	E3X-NA8	E3X-CN11 (3 wires)	E3X-CN12 (1 wire)

When Using 5 Amplifier Units

Amplifier Units (5 Units)	+	1 Master Connector + 4 Slave Connectors
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

Sensor I/O Connectors (Order separately)

Size	Cable type	Shape	Cable length	Model	
M8	Standard cable	Straight 	2 m	4 conductors	XS3F-M421-402-A
			5 m		XS3F-M421-405-A
		L-shaped 	2 m		XS3F-M422-402-A
			5 m		XS3F-M422-405-A

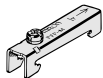
Note: Refer to page NB-6 for details.

Accessories (Order Separately)

Mounting Brackets

Shape	Applicable type	Model	Quantity
	E3X-NA□ E3X-NA□F E3X-NAG□	E39-L143	1
	E3X-NA□V	E39-L148	

End Plate

Shape	Model	Quantity
	PFP-M	1

Applicable fiber unit type

Note: 1. (Free-cut) indicates a unit that can be cut freely.

2. The values of the minimum sensing object for E3X-NA□(V) and E3X-NAG□ through-beam models indicate those obtained where the sensing distance and sensitivity are set to optimum values.

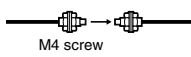
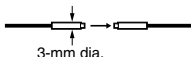
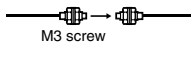
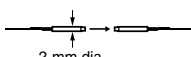
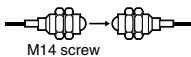
3. The value of the minimum sensing object for E3X-NA□F through-beam models indicates that obtained at the rated sensing distance with the sensitivity set to the optimum value.

4. The size of standard sensing object is the same as the fiber core diameter (lens diameter for models with lens).


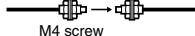




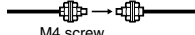




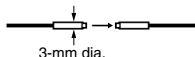




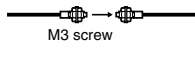




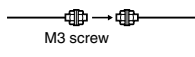








5. The value of the minimum sensing object of the through-beam model assumes that the sensing distance and sensitivity are set to the optimum.

Long distance

■ Red light ■ Green light

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
M4 (Free-cut)	 M4 screw	NA□(V)	■ 700 (2,000)	1.4 mm dia. (0.03 mm dia.)	E32-T11L	25 mm
		NAG□	■ 130 (370)			
		NA□F	■ 210 (600)	1.4 mm dia. (0.5 mm dia.)		
3.0 mm dia. (Free-cut)	 3-mm dia.	NA□(V)	■ 700	1.4 mm dia. (0.03 mm dia.)	E32-T12L	25 mm
		NAG□	■ 130	1.4 mm dia. (0.5 mm dia.)		
		NA□F	■ 210			
M3 (Free-cut)	 M3 screw	NA□(V)	■ 200	0.9 mm dia. (0.03 mm dia.)	E32-T21L	10 mm
		NAG□	■ 40			
		NA□F	■ 60	0.9 mm dia. (0.2 mm dia.)		
2 mm dia. (small diameter) (Free-cut)	 2-mm dia.	NA□(V)	■ 200	0.9 mm dia. (0.03 mm dia.)	E32-T22L	10 mm
		NAG□	■ 40			
		NA□F	■ 60	0.9 mm dia. (0.2 mm dia.)		
With M14 lens, ideal for explosion-proof applications (Free-cut)	 M14 screw	NA□(V)	■ 14,000	10 mm dia. (0.1 mm dia.)	E32-T17L	25 mm
		NA□F	■ 4,200	10 mm dia. (1.5 mm dia.)		

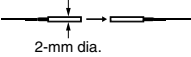
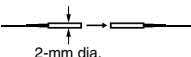
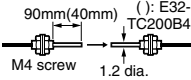
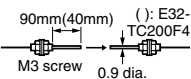
General purpose

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
M4 	 M4 screw	NA□(V)	 400 (3,000)	1.0 mm dia. (0.03 mm dia.)	E32-TC200	25 mm
		NAG□	 75 (550)			
		NA□F	 120 (900)	1.0 mm dia. (0.2 mm dia.)		
M4 	 M4 screw	NA□(V)	 280 (2,100)	1.0 mm dia. (0.03 mm dia.)	E32-ET11R	1 mm
		NAG□	 50 (375)			
		NA□F	 80	1.0 mm dia. (0.2 mm dia.)		
3.0 mm dia. 	 3-mm dia.	NA□(V)	 280	1.0 mm dia. (0.03 mm dia.)	E32-T12R	1 mm
		NAG□	 50			
		NA□F	 80	1.0 mm dia. (0.2 mm dia.)		
M3  Reflective side-view conversion attachment E39-F5 mountable	 M3 screw	NA□(V)	 360	1.0 mm dia. (0.03 mm dia.)	E32-TC200A	25 mm
		NAG□	 65			
		NA□F	 100	1.0 mm dia. (0.2 mm dia.)		
M3  Minute work detection	 M3 screw	NA□(V)	 100	0.5 mm dia. (0.03 mm dia.)	E32-TC200E	10 mm
		NAG□	 20			
		NA□F	 30	0.5 mm dia. (0.1 mm dia.)		
M3 	 M3 screw	NA□(V)	 60	0.5 mm dia. (0.03 mm dia.)	E32-ET21R	1 mm
		NAG□	 12			
		NA□F	 18	0.5 mm dia. (0.1 mm dia.)		

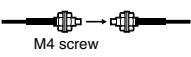
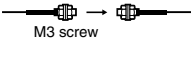
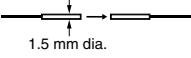
- Note: 1. **Free-cut** indicates a unit that can be cut freely. The unit without the **Free-cut** mark cannot be cut freely.
 2. The values of the minimum sensing object for E3X-NA□(V) and E3X-NAG□ through-beam models indicate those obtained where the sensing distance and sensitivity are set to optimum values.
 3. The value of the minimum sensing object for E3X-NA□F through-beam models indicates that obtained at the rated sensing distance with the sensitivity set to the optimum value.
 4. The size of standard sensing object is the same as the fiber core diameter (lens diameter for models with lens).
 5. The value of the minimum sensing object of the through-beam model assumes that the sensing distance and sensitivity are set to the optimum.

Small diameter head

■ Red light ■ Green light

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
Free-cut 2.0 mm dia. Minute work detection	 <p>2-mm dia.</p>	NA□(V)	■ 100	0.5 mm dia. (0.03 mm dia.)	E32-T22	10 mm
		NAG□	■ 20			
		NA□F	■ 30	0.5 mm dia. (0.1 mm dia.)		
Free-cut 2 mm dia. Small work detection	 <p>2-mm dia.</p>	NA□(V)	■ 60	0.5 mm dia. (0.03 mm dia.)	E32-T22R	1 mm
		NA□F	■ 18	0.5 mm dia. (0.1 mm dia.)		
Free-cut With 1.2 mm dia. sleeve	 <p>90mm(40mm) (): E32-TC200B4 M4 screw 1.2 dia.</p>	NA□(V)	■ 400	1.0 mm dia. (0.03 mm dia.)	E32-TC200B E32-TC200B4	25 mm
		NAG□	■ 75	1.0 mm dia. (0.2 mm dia.)		
		NA□F	■ 120			
Free-cut With 0.9 mm dia. sleeve	 <p>90mm(40mm) (): E32-TC200F4 M3 screw 0.9 dia.</p>	NA□(V)	■ 100	0.5 mm dia. (0.03 mm dia.)	E32-TC200F E32-TC200F4	10 mm
		NAG□	■ 20			
		NA□F	■ 30	0.5 mm dia. (0.1 mm dia.)		

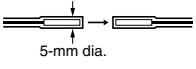
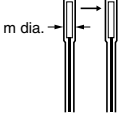
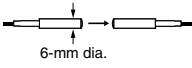
Flexible (resists breaking) (R4)

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
Free-cut Ideal for mounting on moving sections (R4)	 <p>M4 screw</p>	NA□(V)	■ 360	1.0 mm dia. (0.03 mm dia.)	E32-T11	4 mm
		NAG□	■ 65			
		NA□F	■ 100	1.0 mm dia. (0.2 mm dia.)		
	 <p>M3 screw</p>	NA□(V)	■ 100	0.5 mm dia. (0.03 mm dia.)	E32-T21	
		NAG□	■ 18	0.5 mm dia. (0.1 mm dia.)		
		NA□F	■ 30			
	 <p>1.5 mm dia.</p>	NA□(V)	■ 100	0.5 mm dia. (0.03 mm dia.)	E32-T22B	
		NAG□	■ 18			
		NA□F	■ 30	0.5 mm dia. (0.1 mm dia.)		

Side-view

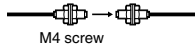
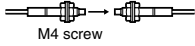
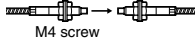
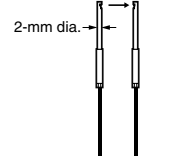
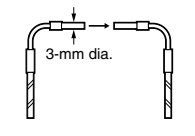
Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)			Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
(Free-cut) Long-distance Space-saving		NA□(V)	240			1.0 mm dia. (0.03 mm dia.)	E32-T14L	25 mm
		NAG□	45					
		NA□F	70			1.0 mm dia. (0.2 mm dia.)		
(Free-cut) Space-saving		NA□(V)	110			1.0 mm dia. (0.03 mm dia.)	E32-T14LR	1 mm
		NA□F	33			1.0 mm dia. (0.2 mm dia.)		
(Free-cut) Small work detection (small diameter)		NA□(V)	90			0.5 mm dia. (0.03 mm dia.)	E32-T24	10 mm
		NAG□	12					
		NA□F	27			0.5 mm dia. (0.3 mm dia.)		
(Free-cut) Small work detection (small diameter)		NA□(V)	30			0.5 mm dia. (0.03 mm dia.)	E32-T24R	1 mm
		NA□F	9			0.5 mm dia. (0.3 mm dia.)		
(Free-cut) Screw- mounting Model		NA□(V)	1,800			4.0 mm dia. (0.03 mm dia.)	E32-T14	25 mm
		NAG□	330					
		NA□F	540			4.0 mm dia. (0.2 mm dia.)		

Chemical resistant

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
<p>(Free-cut)</p> <p>Teflon cover * ensures environmental resistance Operating ambient temperature: -30 to +70°C</p>  <p>5-mm dia.</p>		NA□(V)	1,600	4.0 mm dia. (0.2 mm dia.)	E32-T12F	40 mm
		NAG□	300			
		NA□F	480	4.0 mm dia. (0.7 mm dia.)		
<p>(Free-cut)</p> <p>Teflon cover * ensures environmental resistance Side-view Operating ambient temperature: -30 to +70°C</p>  <p>m dia.</p>		NA□(V)	200	3.0 mm dia. (0.2 mm dia.)	E32-T14F	40 mm
		NAG□	37			
		NA□F	60	3.0 mm dia. (0.7 mm dia.)		
<p>Teflon cover * ensures environmental resistance Operating ambient temperature: -40 to +200°C</p>  <p>6-mm dia.</p>		NA□(V)	350	1.0 mm dia. (0.2 mm dia.)	E32-T81F	10 mm
		NA□F	100	1.0 mm dia. (0.5 mm dia.)		

* Teflon is a registered trademark of Dupont Company and Mitsui Dupont Chemical Company for their fluoride resin.

Heat resistant

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
<p>150°C *1 Free-cut</p> <p>Operating ambient temperature: -40 to +150°C Fiber sheath material: Fluoresin</p>		NA□(V)	400	1.5 mm dia. (0.03 mm dia.)	E32-ET51	35 mm
		NA□F	120	1.5 mm dia. (1 mm dia.)		
<p>200°C</p> <p>Operating ambient temperature: -40 to +200°C Flexible: R10 Fiber sheath material: Teflon*2</p>		NA□(V)	180	1.0 mm dia. (0.2 mm dia.)	E32-T81R	10 mm
		NA□F	50	1.0 mm dia. (0.5 mm dia.)		
<p>300°C *3</p> <p>With spiral tube, excellent in mechanical strength Operating ambient temperature: -40 to +300°C Fiber sheath material: SUS</p>		NA□(V)	300 (3,000)	1.0 mm dia. (0.03 mm dia.)	E32-T61	25 mm
		NA□F	90	1.0 mm dia. (0.5 mm dia.)		
<p>150°C Free-cut</p> <p>Side-view minute work detection Operating ambient temperature: -40 to +150°C Fiber sheath material: Fluoresin</p>		NA□(V)	130	1.0 mm dia. (0.03 mm dia.)	E32-T54	35 mm
		NA□F	35	1.0 mm dia. (0.3 mm dia.)		
<p>200 °C</p> <p>L-shaped Fiber sheath material: SUS</p>		NA□(V)	700	1.7 mm dia. (0.03 mm dia.)	E32-T84S	25 mm
		NA□F	210	1.7 mm dia. (0.4 mm dia.)		


*1. For continuous operation, use the products within the temperature ranging from -40°C to 130°C.

*2. Teflon is a registered trademark of Dupont Company and Mitsui Dupont Chemical Company for their fluoride resin.

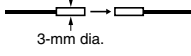
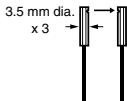
*3. Indicates the heat-resistant temperature at the fiber tip.

- Note: 1. (Free-cut) indicates a unit that can be cut freely. The unit without the (Free-cut) mark cannot be cut freely.
 2. The values of the minimum sensing object for E3X-NA□(V) and E3X-NAG□ through-beam models indicate those obtained where the sensing distance and sensitivity are set to optimum values.
 3. The value of the minimum sensing object for E3X-NA□F through-beam models indicates that obtained at the rated sensing distance with the sensitivity set to the optimum value.
 4. The size of standard sensing object is the same as the fiber core diameter (lens diameter for models with lens).
 5. The value of the minimum sensing object of the through-beam model assumes that the sensing distance and sensitivity are set to the optimum.

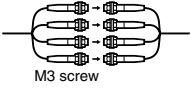
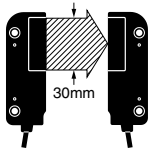
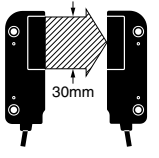
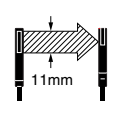
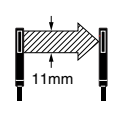
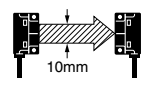
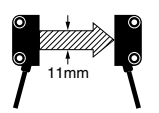
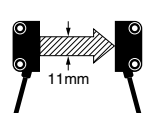
Grooved

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
(Free-cut) Detection of film sheet, beam axis adjustment unnecessary, easy installation		NA□(V)	10	4.0 mm dia. (0.1 mm dia.)	E32-G14	25 mm
		NAG□	10			
		NA□F	10	4.0 mm dia. (1.0 mm dia.)		

Narrow vision field

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
(Free-cut) Ideal for wafer detection		NA□(V)	1,000	1.7 mm dia. (0.5 mm dia.)	E32-T22S	10 mm
		NA□F	300			
(Free-cut) Side-view Ideal for wafer		NA□(V)	700	2.0 mm dia. (0.03 mm dia.)	E32-T24S	
		NA□F	210	2.0 mm dia. (0.5 mm dia.)		



Area sensing





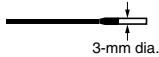



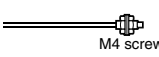



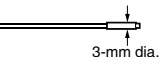



Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm) (Values in parentheses: when using the E39-F1 Lens Unit)	Standard object (mm) Minimum sensing object (Opaque object) Typical	Model	Permissible bending radius
Multi-point detection (4 head)		NA□(V)	300	2.0 mm dia. (0.03 mm dia.)	E32-M21	25 mm
		NA□F	90	2.0 mm dia. (0.3 mm dia.)		
Detects in a 30 mm area <small>(Free-cut)</small>		NA□(V)	920	(0.5 mm dia.) *	E32-T16W	10 mm
		NAG□	170	(4.0 mm dia.) *		
		NA□F	270	(4.0 mm dia.) *		
Detects in a 30 mm area <small>(Free-cut)</small>		NA□(V)	690	(0.5 mm dia.) *	E32-T16WR	1 mm
		NA□F	200	(4.0 mm dia.) *		
Side-view type Ideal for applications that do not have sufficient depth <small>(Free-cut)</small>		NA□(V)	520	(0.3 mm dia.) *	E32-T16J	10 mm
		NAG□	95	(2.0 mm dia.) *		
		NA□F	150	(2.0 mm dia.) *		
Side-view type Ideal for applications that do not have sufficient depth <small>(Free-cut)</small>		NA□(V)	390	(0.3 mm dia.) *	E32-T16JR	1 mm
		NA□F	110	(2.0 mm dia.) *		
Detection in area of 10 mm width, long distance <small>(Free-cut)</small>		NA□(V)	1,500	(0.9 mm dia.) *	E32-T16	25 mm
		NAG□	275	(1.5 mm dia.) *		
		NA□F	450	(1.5 mm dia.) *		
Stable detection of small work in wide area Protective structure: IEC 60529 IP50 <small>(Free-cut)</small>		NA□(V)	600	(0.3 mm dia.) *	E32-T16P	10 mm
		NAG□	110	(2.0 mm dia.) *		
		NA□F	180	(2.0 mm dia.) *		
Stable detection of small work in wide area Protective structure: IEC 60529 IP50 <small>(Free-cut)</small>		NA□(V)	450	(0.3 mm dia.) *	E32-T16PR	1 mm
		NA□F	130	(2.0 mm dia.) *		

* The sensing distance is 100 mm and the value can be detected in each detection area. (The sensing object diameter is the value in stationary status.)

Note: 1. (Free-cut) indicates a unit that can be cut freely. The unit without the (Free-cut) mark cannot be cut freely.
 2. The values of the minimum sensing object indicate those obtained at a distance where the smallest object can be sensed with the Reflective Fiber Unit.












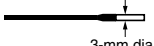




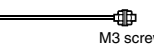




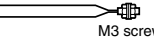



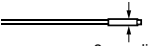


Long distance

 Red light  Green light

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)			Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
M6 (Free-cut)	 M6 screw	NA□(V)	 200			250 x 250 (0.01 mm dia.)	E32-D11L	25 mm
		NAG□	 35			50 x 50 (0.1 mm dia.)		
		NA□F	 65			100 x 100 (0.015 mm dia.)		
3 mm dia. (small diameter) (Free-cut)	 3-mm dia.	NA□(V)	 120			150 x 150 (0.01 mm dia.)	E32-D12	25 mm
		NAG□	 20			25 x 25 (0.1 mm dia.)		
		NA□F	 40			50 x 50 (0.015 mm dia.)		
M4 (Free-cut)	 M4 screw	NA□(V)	 50			100 x 100 (0.01 mm dia.)	E32-D21L	10 mm
		NAG□	 10			25 x 25 (0.1 mm dia.)		
		NA□F	 17			25 x 25 (0.015 mm dia.)		
3 mm dia. (small diameter) (Free-cut)	 3-mm dia.	NA□(V)	 50			100 x 100 (0.01 mm dia.)	E32-D22L	10 mm
		NAG□	 10			25 x 25 (0.1 mm dia.)		
		NA□F	 17			25 x 25 (0.015 mm dia.)		

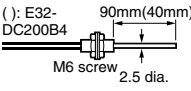
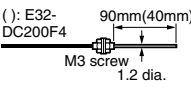
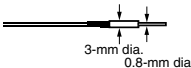
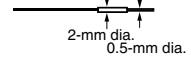
* Sensing distance indicates values for white paper.

General purpose

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)			Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
M6 	 M6 screw	NA□(V)	 150			200 x 200 (0.01 mm dia.)	E32-DC200	25 mm
		NAG□	 25			50 x 50 (0.1 mm dia.)		
		NA□F	 50			75 x 75 (0.015 mm dia.)		
M6 	 M6 screw	NA□(V)	 90			150 x 150 (0.01 mm dia.)	E32-ED11R	1 mm
		NAG□	 15			25 x 25 (0.1 mm dia.)		
		NA□F	 30			50 x 50 (0.02 mm dia.)		
3.0 mm dia. 	 3-mm dia.	NA□(V)	 90			150 x 150 (0.01 mm dia.)	E32-D12R	1 mm
		NAG□	 15			25 x 25 (0.1 mm dia.)		
		NA□F	 30			50 x 50 (0.02 mm dia.)		
M3 (small diameter) 	 M3 screw	NA□(V)	 36			50 x 50 (0.01 mm dia.)	E32-DC200E	10 mm
		NAG□	 6			25 x 25 (0.1 mm dia.)		
		NA□F	 12			25 x 25 (0.02 mm dia.)		
M3 (small diameter) 	 M3 screw	NA□(V)	 15			25 x 25 (0.01 mm dia.)	E32-ED21R	1 mm
		NA□F	 5			25 x 25 (0.03 mm dia.)		
3 mm dia. (small diameter) 	 3-mm dia.	NA□(V)	 15			25 x 25 (0.01 mm dia.)	E32-D22R	1 mm
		NA□F	 5			25 x 25 (0.03 mm dia.)		



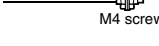
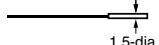
* Sensing distance indicates values for white paper.

Thin fiber

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)			Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
With 2.5 mm sleeve <small>(Free-cut)</small>		NA□(V)	150			200 x 200 (0.01 mm dia.)	E32-DC200B E32-DC200B4	25 mm
		NAG□	25			50 x 50 (0.1 mm dia.)		
		NA□F	50			75 x 75 (0.015 mm dia.)		
With 1.2 mm dia. sleeve <small>(Free-cut)</small>		NA□(V)	36			50 x 50 (0.01 mm dia.)	E32-DC200F E32-DC200F4	10 mm
		NAG□	6			25 x 25 (0.1 mm dia.)		
		NA□F	12			25 x 25 (0.02 mm dia.)		
0.8 mm minute work detection <small>(Free-cut)</small>		NA□(V)	10			25 x 25 (0.01 mm dia.)	E32-D33	4 mm
		NA□F	3.3			25 x 25 (0.03 mm dia.)		
0.5 mm dia. Very small work detection		NA□(V)	1.5			25 x 25 (0.01 mm dia.)	E32-D331	4 mm
		NA□F	0.5			25 x 25 (0.05 mm dia.)		

* Sensing distance indicates values for white paper.

Flexible (resists breaking) (R4)

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)			Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
Ideal for installation on moving sections (R4) <small>(Free-cut)</small>		NA□(V)	90			150 x 150 (0.01 mm dia.)	E32-D11	4 mm
		NAG□	15			25 x 25 (0.1 mm dia.)		
		NA□F	30			50 x 50 (0.015 mm dia.)		
		NA□(V)	15			25 x 25 (0.01 mm dia.)	E32-D21	
		NA□F	5			25 x 25 (0.02 mm dia.)		
		NA□(V)	15			25 x 25 (0.01 mm dia.)	E32-D21B	
		NAG□	2.4			25 x 25 (0.1 mm dia.)		
		NA□F	5			25 x 25 (0.02 mm dia.)		
		NA□(V)	7			25 x 25 (0.01 mm dia.)	E32-D22B	
		NA□F	2.3			25 x 25 (0.02 mm dia.)		

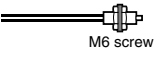
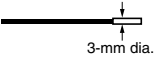
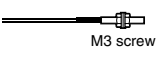
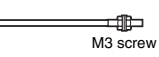
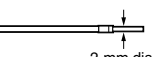
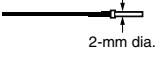
* Sensing distance indicates values for white paper.

Note: 1. (Free-cut) indicates a unit that can be cut freely. The unit without the (Free-cut) mark cannot be cut freely.

2. The values of the minimum sensing object indicate those obtained at a distance where the smallest object can be sensed with the Reflective Fiber Unit.

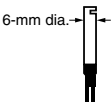
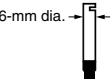
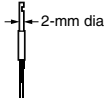

Coaxial

■ Red light ■ Green light

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)			Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
M6 precision positioning (Free-cut)		NA□(V)	150			200 x 200 (0.01 mm dia.)	E32-CC200	25 mm
		NAG□	25			50 x 50 (0.1 mm dia.)		
		NA□F	50			75 x 75 (0.015 mm dia.)		
3 mm dia. (small diameter) precision positioning (Free-cut)		NA□(V)	80			100 x 100 (0.01 mm dia.)	E32-D32L	
		NAG□	12			25 x 25 (0.1 mm dia.)		
		NA□F	25			50 x 50 (0.02 mm dia.)		
M3 precision positioning Small spot lens (E39-F3A-5/ F3B/F3C) mountable (Free-cut)		NA□(V)	40			50 x 50 (0.01 mm dia.)	E32-EC31	
		NAG□	6			25 x 25 (0.1 mm dia.)		
		NA□F	13			25 x 25 (0.02 mm dia.)		
M3 precision positioning Small spot lens (E39-F3A-5/ F3B/F3C) mountable		NA□(V)	15			25 x 25 (0.01 mm dia.)	E32-EC41	
		NA□F	5			25 x 25 (0.02 mm dia.)		
2 mm dia. precision positioning Small spot lens (E39-F3A) mountable (Spot diameter 0.1 to 0.6 mm variable)		NA□(V)	15			25 x 25 (0.01 mm dia.)	E32-C42	
		NA□F	5			25 x 25 (0.02 mm dia.)		
2 mm dia. precision positioning Small spot lens (E39-F3A) mountable (Spot diameter 0.5 to 1 mm variable) (Free-cut)		NA□(V)	40			50 x 50 (0.01 mm dia.)	E32-D32	
		NAG□	6			25 x 25 (0.1 mm dia.)		
		NA□F	13			25 x 25 (0.02 mm dia.)		

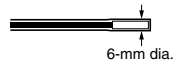
* Sensing distance indicates values for white paper.

Side-view

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)				Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
6 mm dia. Long distance <small>(Free-cut)</small>		NA□(V)	40				50 x 50 (0.03 mm dia.)	E32-D14L	25 mm
		NAG□	10				25 x 25 (0.3 mm dia.)		
		NA□F	13				25 x 25 (0.03 mm dia.)		
6 mm dia. <small>(Free-cut)</small>		NA□(V)	16				25 x 25 (0.03 mm dia.)	E32-D14LR	1 mm
		NA□F	5						
2 mm dia. (small diameter) Space saving <small>(Free-cut)</small>		NA□(V)	15				25 x 25 (0.03 mm dia.)	E32-D24	10 mm
		NAG□	2.4				25 x 25 (0.3 mm dia.)		
		NA□F	5				25 x 25 (0.03 mm dia.)		
2 mm dia. (small diameter) Space saving <small>(Free-cut)</small>		NA□(V)	7				25 x 25 (0.03 mm dia.)	E32-D24R	1 mm
		NA□F	2.3						

* Sensing distance indicates values for white paper.

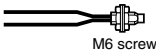
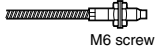
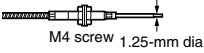
Chemical resistant

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)*1				Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
Teflon-covered *2 High environmental resistance Operating ambient temperature: -30 to +70°C <small>(Free-cut)</small>		NA□(V)	50				100 x 100 (0.03 mm dia.)	E32-D12F	40 mm
		NAG□	8				25 x 25 (0.3 mm dia.)		
		NA□F	16				25 x 25 (0.03 mm dia.)		

*1. Sensing distance indicates values for white paper.

*2. Teflon is a registered trademark of Dupont Company and Mitsui Dupont Chemical Company for their fluoride resin.

Heat resistant


Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)*1			Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
(Free-cut) 150°C *2 Oper- ating ambient temperature: -40 to +150°C Fiber sheath material: Fluor- oresin		NA□(V)	120			150 x 150 (0.03 mm dia.)	E32-ED51	35 mm
		NA□F	40			50 x 50 (0.03 mm dia.)		
300°C *3 Oper- ating ambient temperature: -40 to +300°C Fiber sheath material: SUS		NA□(V)	45			100 x 100 (0.03 mm dia.)	E32-D61	25 mm
		NA□F	15			25 x 25 (0.03 mm dia.)		
400°C Operat- ing ambient temperature: -40 to +400°C Fiber sheath material: SUS		NA□(V)	30			50 x 50 (0.03 mm dia.)	E32-D73	25 mm
		NA□F	10			25 x 25 (0.03 mm dia.)		

*1. Sensing distance indicates values for white paper.

*2. For continuous operation, use the products within the temperature ranging from -40°C to 130°C.

*3. Indicates the heat-resistant temperature at the fiber tip.

Area sensing

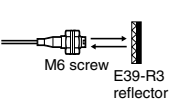


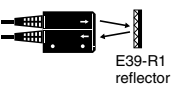
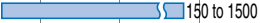

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)			Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
(Free-cut) Side-view type Wide detection of wide area		NA□(V)	75			100 x 100 (0.03 mm dia.)	E32-D36P1	25 mm
		NA□F	25			50 x 50 (0.03 mm dia.)		

* Sensing distance indicates values for white paper.

Note: 1. **Free-cut** indicates a unit that can be cut freely. The unit without the **Free-cut** mark cannot be cut freely.
 2. The values of the minimum sensing object indicate those obtained at a distance where the smallest object can be sensed with the Reflective Fiber Unit.
















Retroreflective

Red light

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)	Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
Free-cut Opaque object detection		NA□(V)	 10 to 250	35.0 mm dia. (0.3 mm dia.)	E32-R21 + E39-R3 (Attachment)	10 mm
		NA□F	 10 to 250	35.0 mm dia. (0.5 mm dia.)		
Free-cut Opaque object detection Operating ambient temperature: -25 to +55°C Protective structure: IEC 60529 IP66		NA□(V)	 150 to 1500	35.0 mm dia. (0.6 mm dia.)	E32-R16 + E39-R1 (Attachment)	25 mm
		NA□F	 150 to 1000	35.0 mm dia. (0.4 mm dia.)		

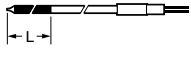
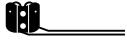
* Sensing distance indicates values for white paper.

Limited reflective

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)	Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
Free-cut Ideal for positioning of crystal glass		NA□(V)	 4 to 12	---	E32-L56E1 E32-L56E2	35 mm
		NA□F	 4 to 12			
Free-cut Wafer/small height difference detection Operating ambient temperature: -40 to +105°C Protective structure: IEC 60529 IP50		NA□(V)	 4 ± 2	25 x 25 (0.015 mm dia.)	E32-L24L	10 mm
		NA□F	 4 ± 2	25 x 25 (0.03 mm dia.)		
		NA□(V)	 7.2±1.8	25 x 25 (0.015 mm dia.)	E32-L25L	
		NA□F	 7.2±1.8	25 x 25 (0.03 mm dia.)		
Free-cut Wafer/small height difference detection Protective structure: IEC 60529 IP50		NA□(V)	 3.3	25 x 25 (0.015 mm dia.)	E32-L25	25 mm
		NA□F	 3.3	25 x 25 (0.03 mm dia.)		
		NA□(V)	 3.3	25 x 25 (0.015 mm dia.)	E32-L25A	
		NA□F	 3.3	25 x 25 (0.03 mm dia.)		

* Sensing distance indicates values for white paper.

Fluid level detection

Features	Shape	Compatible Amplifier Units (E3X-)	Sensing distance (mm)	Standard object (mm) Minimum sensing object (Gold wire) typical	Model	Permissible bending radius
Fluid contact type Unbendable section L = 150, 350 mm (2 types)		NA□(V)	---	---	E32-D82F1 E32-D82F2	40 mm
		NA□F				
Tube mounting type <small>Free-cut</small>		NA□(V)	---	---	E32-L25T	10 mm
		NA□F				

* Sensing distance indicates values for white paper.

Rating/performance

Amplifier Units

Item	Model	Type	Pre-wired				Connector type	
			Standard models	High-speed de- tection models	Mark-detecting models	Water-resistant models	Standard models	Water-resistant mod- els (M8 Connector)
			NPN output	PNP output				
			E3X-NA11	E3X-NA11F	E3X-NAG11	E3X-NA11V	E3X-NA6	E3X-NA14V
			E3X-NA41	E3X-NA41F	E3X-NAG41	E3X-NA41V	E3X-NA8	E3X-NA44V
Light source (wave length)	Red LED (680 nm)			Green LED (520 nm)	Red LED (680 nm)			
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p): 10% max.							
Current consumption	35 mA max.	35 mA max. (at power supply voltage 24 VDC)		35 mA max.				
Control output	Load current 50 mA (residual voltage 1 V max. each) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON switch selectable							
Response time	Operation or re-set: 200 μs max. *	Operating: 20 μs max. Reset: 30 μs max.		200 μs max. for operation and reset respectively (See note.)				
Sensitivity adjustment	8-turn endless adjuster (with indicator)							
Protective circuits	Reverse polarity protection, output short-circuit protection, mutual interference prevention (optically synchronized)		Reverse polarity protection, output short-circuit protection		Reverse polarity protection, output short-circuit protection, mutual interference prevention (optically synchronized)			
Timer function	OFF-delay timer: 40 ms (fixed)							
Ambient illuminance	Incandescent lamp: 10,000 lux max. Sunlight: 20,000 lux max.							
Ambient temperature	Operating: Groups of 1 to 3 Amplifiers: -25 to +55°C, Groups of 4 to 11 Amplifiers: -25 to +50°C, Groups of 12 to 16 Amplifiers: -25 to +45°C Storage: -30 to +70°C (with no icing and condensation)							
Ambient humidity	Operating/Storage: 35% to 85% RH (with no condensation)							
Insulation resistance	20 M Ω min. at 500 VDC							
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute						500 VAC at 50/60 Hz for 1 minute	
Vibration resistance	10 to 55 Hz with a 1.5 mm double amplitude for 2 hrs each in X, Y and Z directions							
Shock resistance	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions							
Protective structure	IEC 60529 IP50 (with Protective Cover attached)				IEC 60529 IP66 (with Protective Cover attached)	IEC 60529 IP50 (with Protective Cover attached)	IEC 60529 IP66 (with Protective Cover attached)	
Connection method	Pre-wired models (standard length: 2 m)					Connector type	M8 connector	
Weight (Packed state)	Approx. 100 g				Approx. 110 g	Approx. 55 g	65 g	
Material	Case	PBT (polybutylene terephthalate)						
	Cover	Polycarbonate			Polyethersulfone (PES)	Polycarbonate	Polyethersulfone (PES)	
Accessories	Instruction manual							

* If 8 or more Units are installed side-by-side, the response time will be 350 μs max.

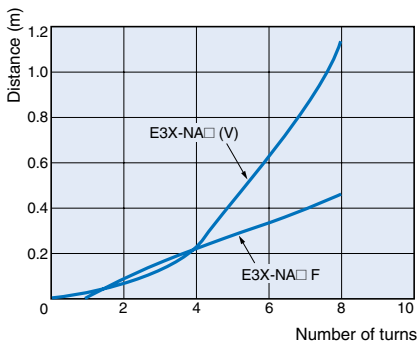
Amplifier Unit Connectors

Item	Model	E3X-CN11	E3X-CN12
Rated current		2.5 A	
Rated voltage		50 V	
Contact resistance		20 mΩ max. (20 mVDC max., 100 mA max.) [By connection with amplifier unit and connection with adjacent connector (except conductor resistance of cable)]	
No. of insertions		50 times (By connection with amplifier unit and connection with adjacent connector)	
Material	Housing	PBT (polybutylene terephthalate)	
	Contacts	Phosphor bronze/gold-plated nickel	
Weight (Packed state)		Approx. 55 g	Approx. 25 g

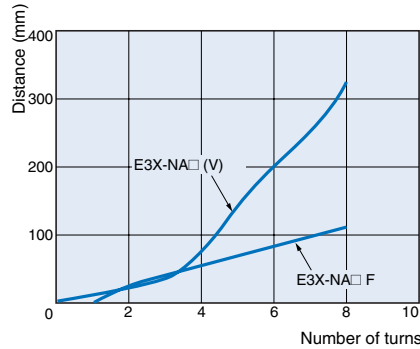
Characteristic data (typical)

Number of Turns of Sensitivity Adjuster vs. Sensing Distance

E32-T11L

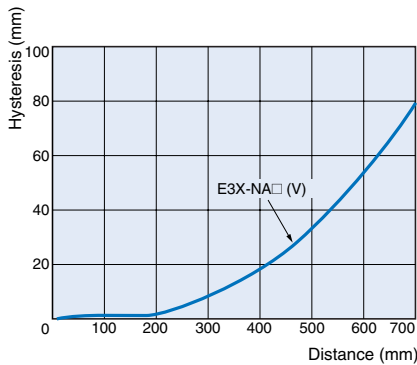


E32-D11L

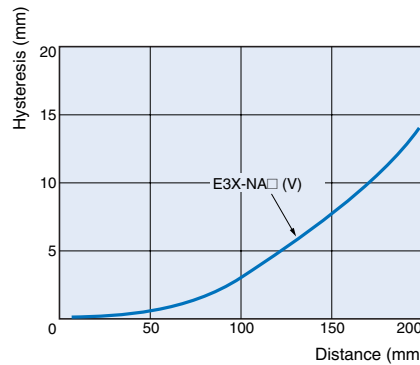


Sensing Distance vs. Hysteresis

E32-T11L



E32-D11L



Output Circuit Diagram

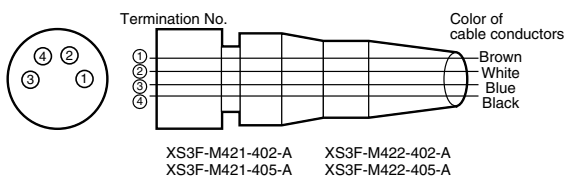
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3X-NA11 E3X-NA6 E3X-NAG11 E3X-NA11F E3X-NA11V E3X-NA14V	Light ON		L•ON (LIGHT ON)	<p>M8 Connector Pin Arrangement</p> <p>Note: Pin 2 is open.</p>
	Dark ON		D•ON (DARK ON)	<p>M8 Connector Pin Arrangement</p> <p>Note: Pin 2 is open.</p>

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3X-NA41 E3X-NA8 E3X-NAG41 E3X-NA41F E3X-NA41V E3X-NA44V	Light ON		L•ON (LIGHT ON)	<p>M8 Connector Pin Arrangement</p> <p>Note: Pin 2 is open.</p>
	Dark ON		D•ON (DARK ON)	<p>M8 Connector Pin Arrangement</p> <p>Note: Pin 2 is open.</p>

Connectors (Sensor I/O connectors)

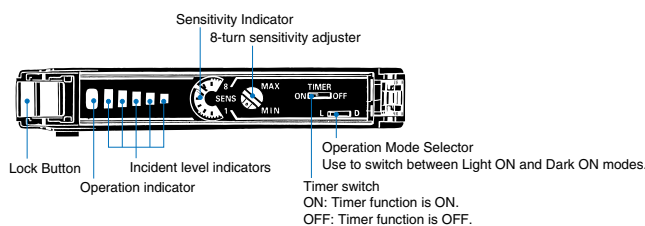


Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	Power supply (+V)
	White	②	-
	Blue	③	Power supply (0 V)
	Black	④	Output

Note: Pin 2 is not used.

Nomenclature:

Amplifier Units



Operation

Indicator status

In addition to the operation indicator (orange), E3X-NA has indicators that denote the incident level (4 green and 1 red indicators). Use them for optical axis adjustment and maintenance.

Indicator status (L/ON)	Operation indicator (L/ON)	Incident level
<p>Operation indicator Incident level indicators</p> <p>Not lit Lit (See note)</p>	Not lit	Approx. 80% to 90% of operating level
	Not lit	Approx. 80% to 90% of operating level
	Not lit or lit	Approx. 90% to 110% of operating level
	Lit	Approx. 110% to 120% of operating level
	Lit	Approx. 120% min. of operating level

Note: The rightmost indicator is turned ON at the "0 incident level".

Precautions

Correct Use

Amplifier Units

Design

Communications Hole

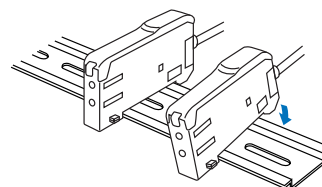
The window provided in the side face of the unit is a communication window for prevention of mutual interference when it is connected with the other unit. Note that the optional Mobile Console E3X-MC11 cannot be used. When the incident level of the sensor is excessive, mutual interference prevention may not be activated. At that time, make adjustment with the sensitivity adjuster. When the unit is used with the E3X-DA-N series, mutual interference prevention is not activated.

Mounting

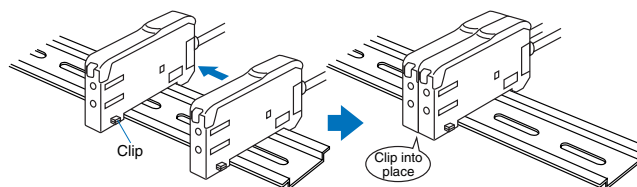
Connection/removing of amplifier units

(Connection)

1. Install the Amplifier Units one at a time onto the DIN track.



2. Slide the Amplifier Units together, line up the clips, and press the Amplifier Units together until they click into place.



(Removing)

Slide one unit away from the other and remove them one by one. (Do not remove the connected units together from the DIN rail.)

Note: 1. When the amplifier units are interconnected, the operating ambient temperature changes depending on the number of connected amplifier units. Check "Ratings/Performance".
2. Before connecting or removing the units, always switch power off.

Operating Environment

Ambient Conditions

Always remove dust, dirt, etc. from the optical communication window, which may disable communication.

Miscellaneous

Protective Cover

Be sure to set the Protective Cover before use.

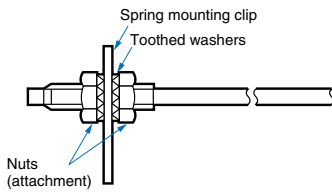
Fiber Units

Installation

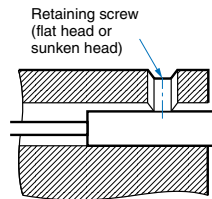
Tightening Force

The tightening force applied to the Fiber Unit should be as follows:

Screw-mounting

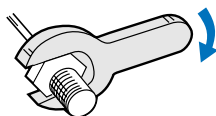


Model Cylindrical Model



Fiber Units	Clamping torque
M3/M4 screw	0.78 Nm max.
M6 screw/6 mm dia. column	0.98 Nm max.
1.5 mm dia. column	0.2 Nm max.
2 mm dia./3 mm dia. column	0.29 Nm max.
E32-T12F 5 mm dia. Teflon model	0.78 Nm max.
E32-D12F 6 mm dia. Teflon model	
E32-T16	0.49 Nm max.
E32-R21	0.59 Nm max.
E32-M21	0.49 Nm max. for up to 5 mm from front end, 0.78 Nm max. for more than 5 mm from front end
E32-L25A	0.78 Nm max.
E32-T16P E32-T16PR E32-T24S E32-L24L E32-L25L E32-T16J E32-T16JR	0.29 Nm max.
E32-T16W E32-T16WR	0.3 Nm max.

Use a proper-sized wrench.

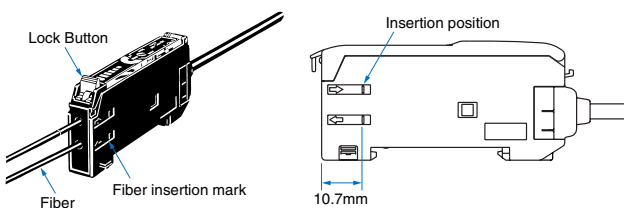


Fiber Connection and Disconnection

The E3X Amplifier Unit has a lock button. Connect or disconnect the fibers to or from the E3X Amplifier Unit using the following procedures:

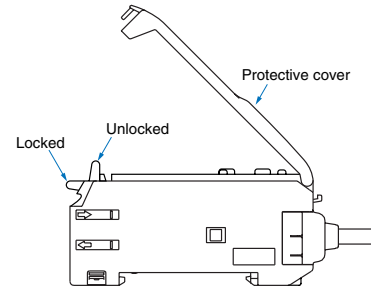
1. Connection

Open the protective cover, insert the fibers according to the fiber insertion marks on the side of the Amplifier Unit, and lower the lock button.



2. Disconnection

Remove the protective cover and raise the lock button to pull out the fiber.



Note: To maintain the fiber properties, confirm that the lock is released before removing the fiber.

3. Precautions for Fiber Connection/Disconnection

Be sure to lock or unlock the lock button within an ambient temperature range between -10°C and 40°C.

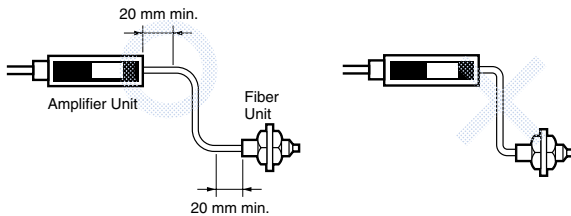
Cutting Fiber

- Insert a fiber into the Fiber Cutter and determine the length of the fiber to be cut.
- Press down the Fiber Cutter in a single stroke to cut the fiber.
- The cutting holes cannot be used twice. If the same hole is used twice, the cutting face of the fiber will be rough and the sensing distance will be reduced. Always use an unused hole.
- Cut a thin fiber as follows:

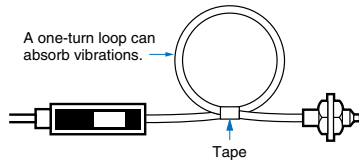
①	An attachment is temporarily fitted to a thin fiber before shipment.	
②	Secure the attachment after adjusting the position of it in the direction indicated by the arrow.	
③	Insert the fiber to be cut into the E39-F4.	
④	Finished state (proper cutting state)	

Connection

- Do not strain the fiber unit, e.g. do not apply tensile or compression force. (Within 9.8 Nm or 29.4 Nm) Use special care since the fiber is thin.
- The bending radius of the fiber unit should be more than the permissible bending radius given in "Type/standard price" and "Ratings/performance".
- Do not bend the edge of the Fiber Units (excluding the E32-T□R and E32-D□R).

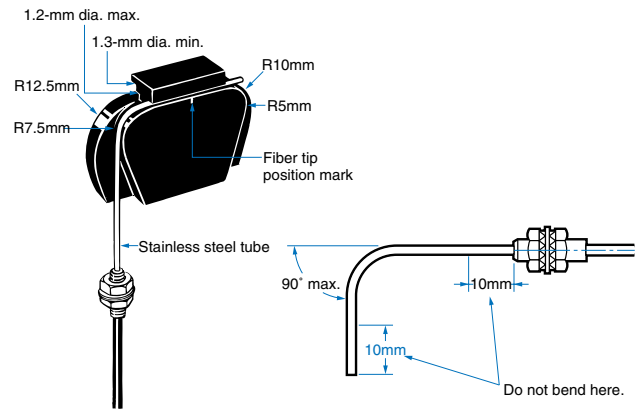


- Do not apply excess force on the Fiber Units.
- The Fiber Head could break by excessive vibration. To prevent this, the following is effective:



E39-F11 Sleeve Bender

- The bending radius of the stainless steel tube should be as large as possible. The smaller the bending radius becomes, the shorter the sensing distance will be.
- Insert the tip of the stainless steel tube to the Sleeve Bender and bend the stainless steel tube slowly along the curve of the Sleeve Bender (refer to the figure).

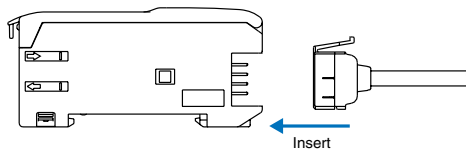


Amplifier Unit Connectors

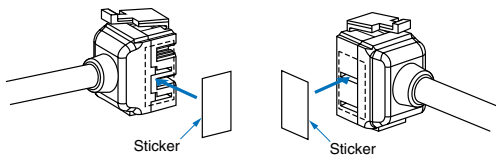
Installation

Installation Connectors

1. Insert the Master or Slave Connector into the Amplifier Unit until it clicks into place.



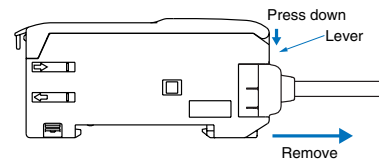
2. Join Amplifier Units together as required after all the Master and Slave Connectors have been inserted.
3. Apply the supplied seal to the non-connection surface of the master/slave connector.



Note: Apply the seal to the grooved side.

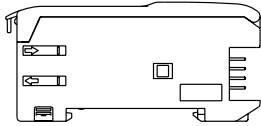
Removing Connectors

1. Slide the slave Amplifier Unit for which the Connector is to be removed away from the rest of the group.
2. After the Amplifier Unit has been separated, press down on the lever on the Connector and remove it. (Do not attempt to remove Connectors without separating them from other Amplifier Units first.)



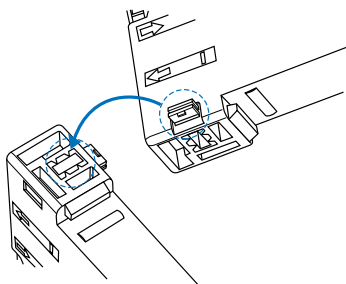
Mounting End Plate (PFP-M)

Depending on the installation type, an Amplifier Unit may move during operation. In this case, use an End Plate. Before installing an End Plate, remove the clip from the master Amplifier Unit using a nipper or similar tool.

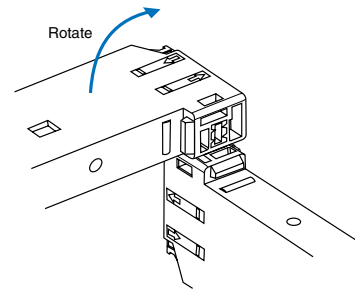


The sensor bottom is also equipped with the clip removing mechanism.

1. Insert the clip to be removed into the slit underneath the clip on another Amplifier Unit.



2. Remove the clip by rotating the Amplifier Unit.



Pull Strengths for Connectors (Including Cables)

E3X-CN11: 30 N max. E3X-CN12: 12 N max.

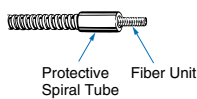
Accessories

Use of E39-R3 Reflector

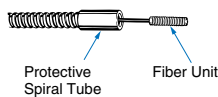
1. When using an adhesive tape on the rear face, apply it after washing away oil, dust, etc. from the place of application. The reflector cannot be installed if there remains oil, etc.
2. The E39-R3 cannot be used in places where it is exposed to oil or chemicals.

E39-F32 Protective Spiral Tubes

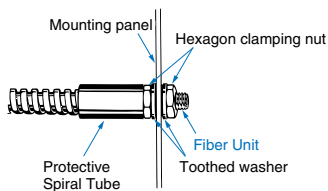
1. Insert a fiber to the Protective Spiral Tube from the head connector side (screwed) of the tube.



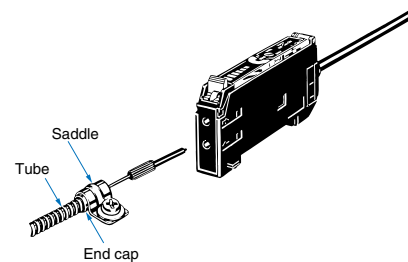
2. Push the fiber into the Protective Spiral Tube. The tube should be straight so that the fiber is not twisted when inserted. Then turn the end cap of the spiral tube.



3. Secure the Protective Spiral Tube on a suitable place with the attached nut.

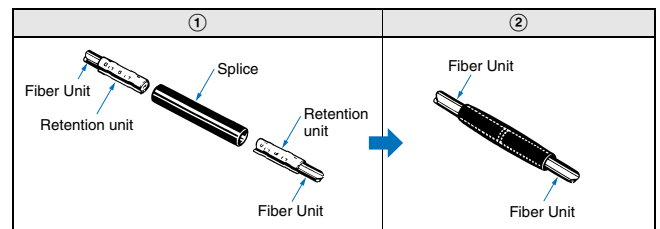


4. Use the attached saddle to secure the end cap of the Protective Spiral Tube. To secure the Protective Spiral Tube at a position other than the end cap, apply tape to the tube so that the portion becomes thicker in diameter.



E39-F10 Fiber Connector

Fit the connector in the following procedure.



- The Fiber Units should be as close as possible when they are connected. Sensing distance will be reduced by approximately 25% when fibers are connected.
- Only 2.2 mm dia. fibers can be connected.

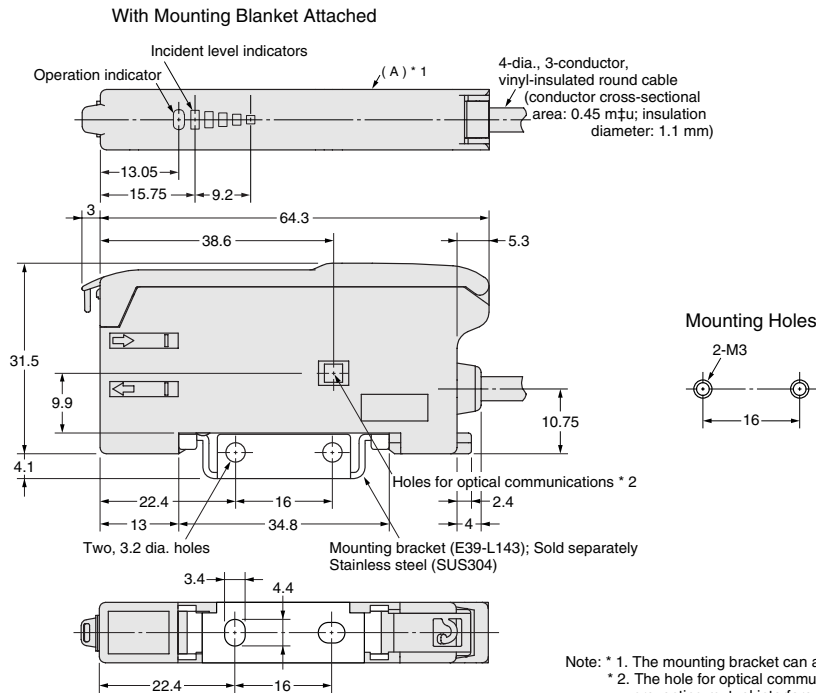
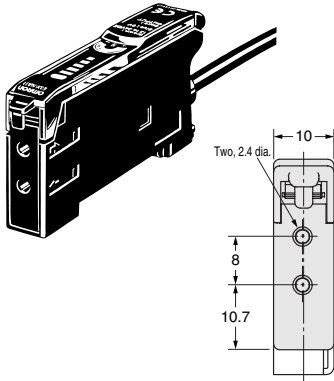
Dimensions (Unit: mm)

Amplifier Units

Pre-wired

- E3X-NA11
- E3X-NA11F
- E3X-NA41
- E3X-NA41F
- E3X-NAG11
- E3X-NAG41

CAD file E3X_05

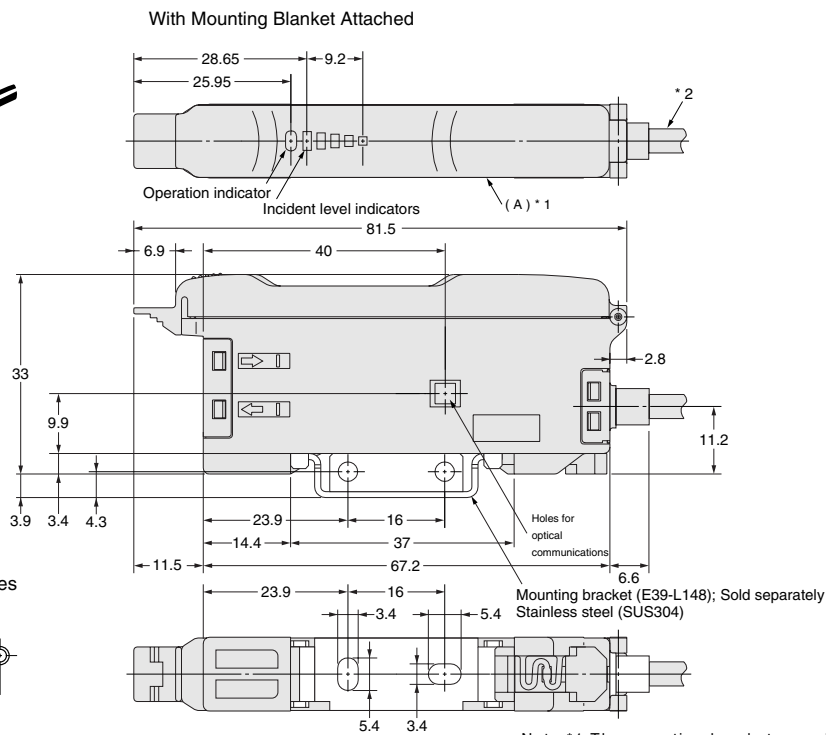
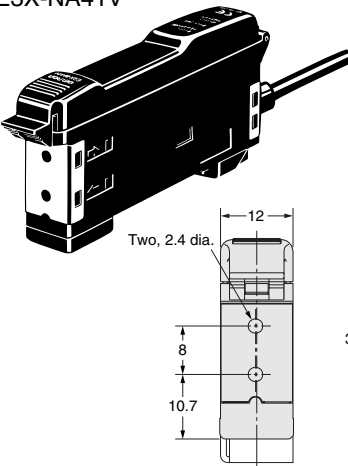


Note: * 1. The mounting bracket can also be used on side A.
 * 2. The hole for optical communications is for preventing mutual interference. There is no hole for E3X-NA□F models.

Amplifier Units with cables,
Water-resistant Models

- E3X-NA11V
- E3X-NA41V

CAD file E3X_10

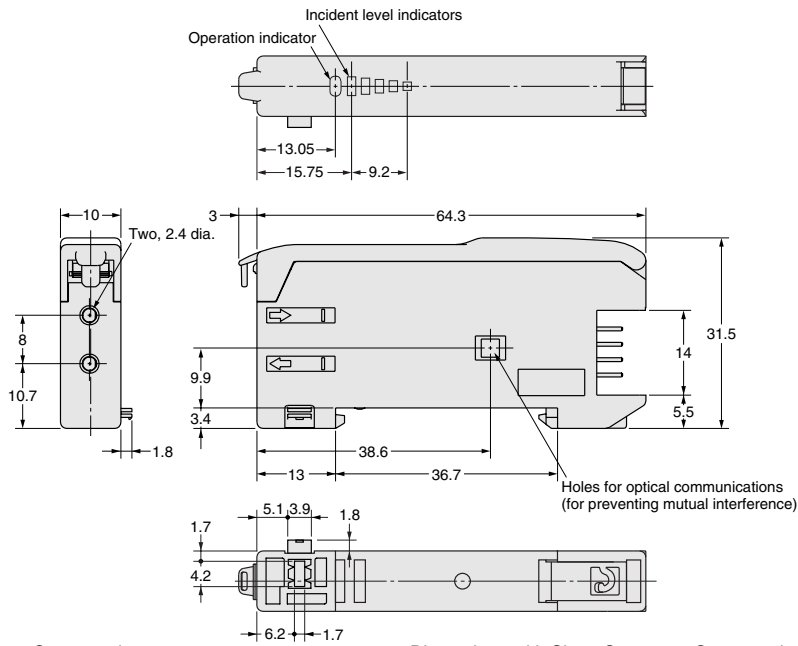
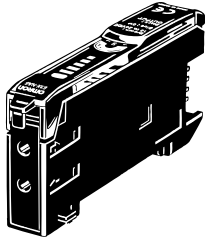


Note: * 1. The mounting bracket can also be used on side A.
 * 2. 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.45 mm²; insulation diameter: 1.1 mm)

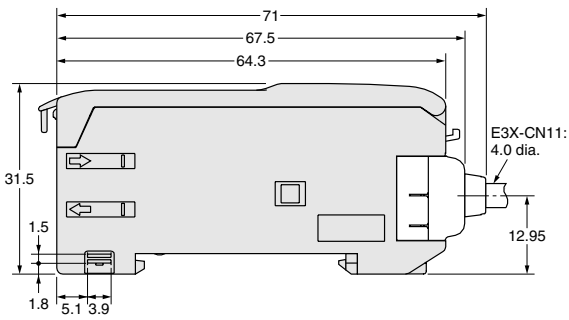
Connector type

E3X-NA6
E3X-NA8

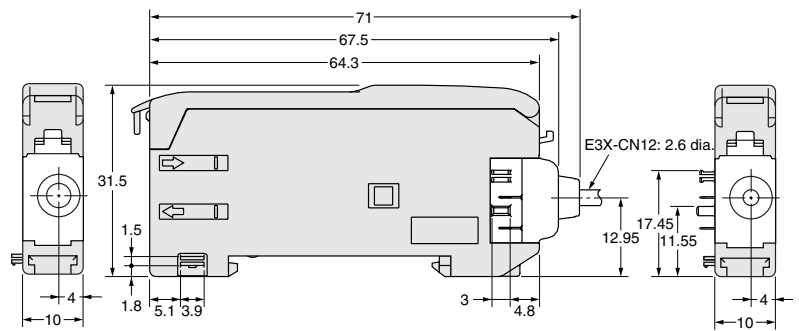
CAD file E3X_06



Dimensions with Master Connector Connected



Dimensions with Slave Connector Connected

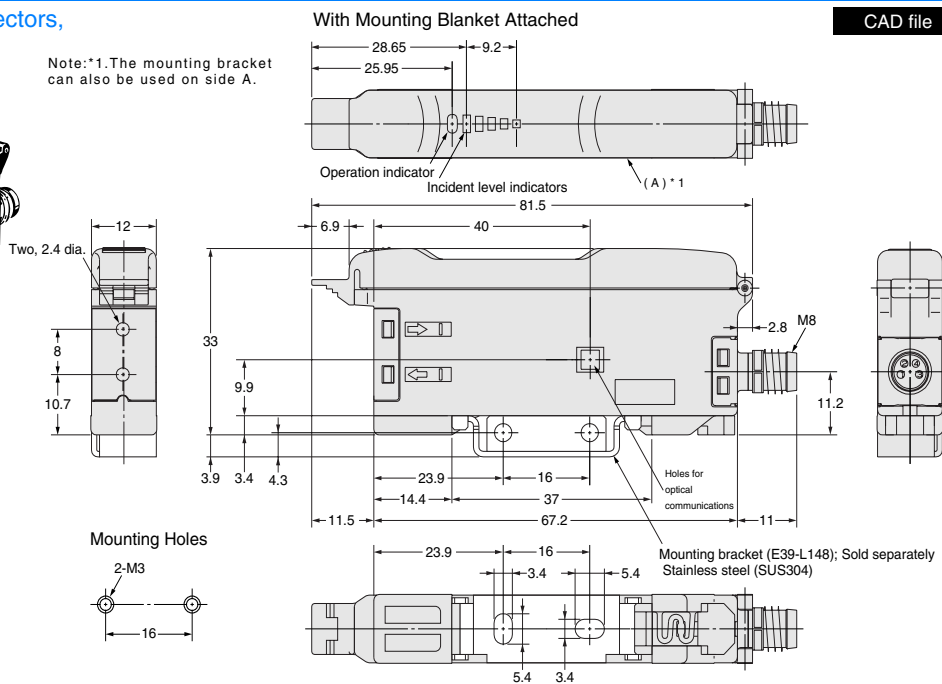


Amplifier Units M8 Connectors,
Water-resistant Models

E3X-NA14V
E3X-NA44V

CAD file E3X_11

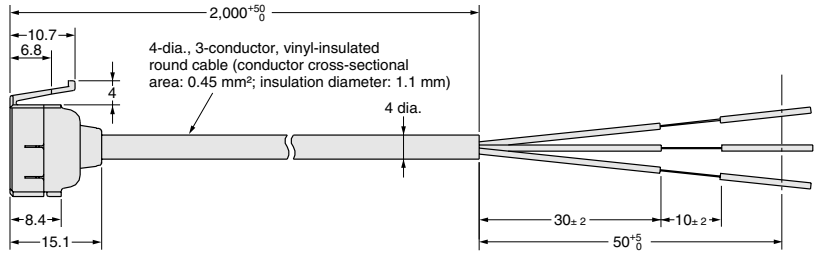
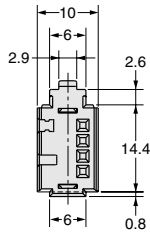
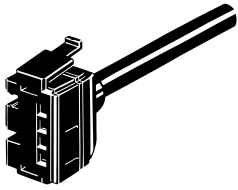
Note: *1. The mounting bracket can also be used on side A.



Amplifier Unit Connectors

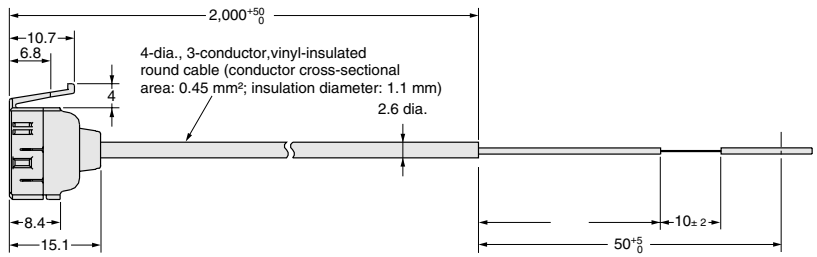
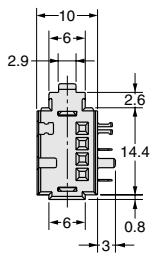
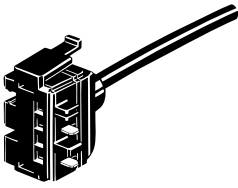
Master connector

E3X-CN11



Slave connector

E3X-CN12

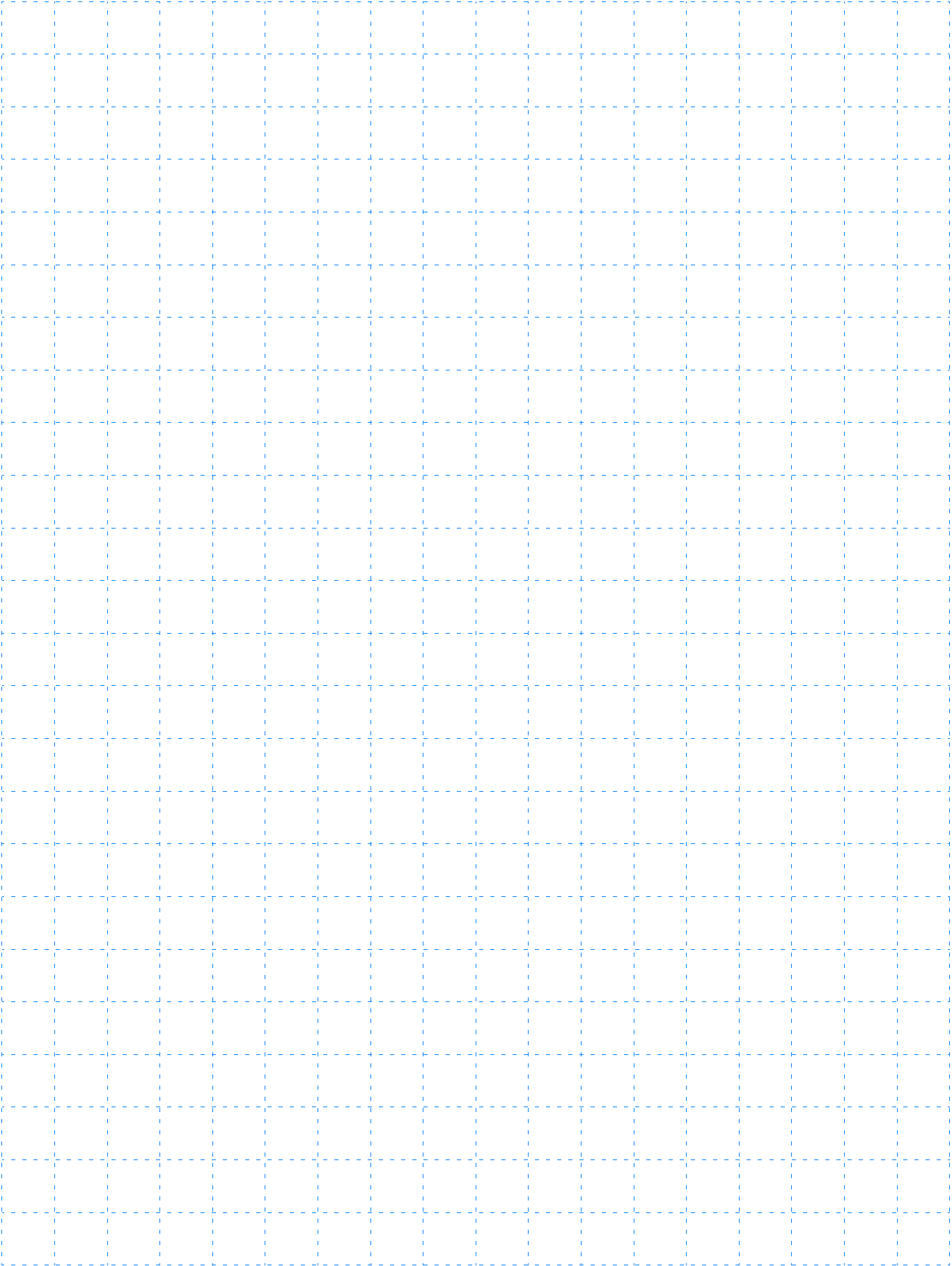


Accessories (Order Separately)

Mounting Brackets

A-314

MEMO



E3X-NA

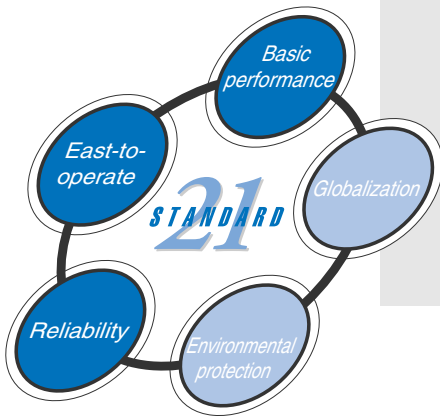
Photoelectric Sensor with Built-in Amplifier

E3Z

For almost all binary-detection applications, you can make selection from the E3Z



CE

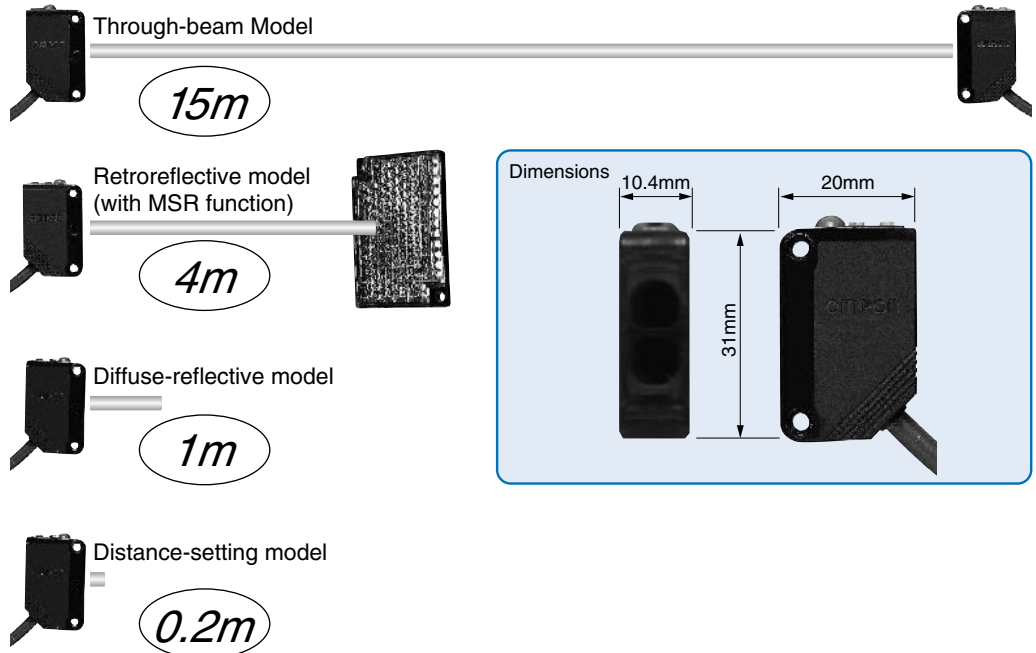


Features

Basic performance

Photoelectric Sensor with built-in amplifier is applicable to a wide variety of lines and ensures a longer sensing distance than any other model.

Lineup of models corresponding to applications (thin beam, transparent, grooved)



Globalization

Meets a variety of international standards, thus allowing use in any country.

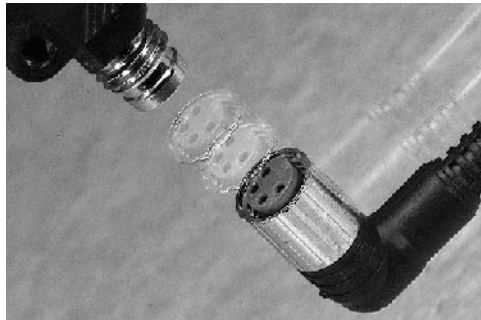


Global network with 191 offices in 38 countries. M8-connector, PNP output types that meet international standards are available.

Easy-to-operate

User-friendly Photoelectric Sensor takes all installation and on-site conditions into consideration.

A general-purpose connector ensures easy on-site installation!



The compact and space-saving model can be installed in any location.



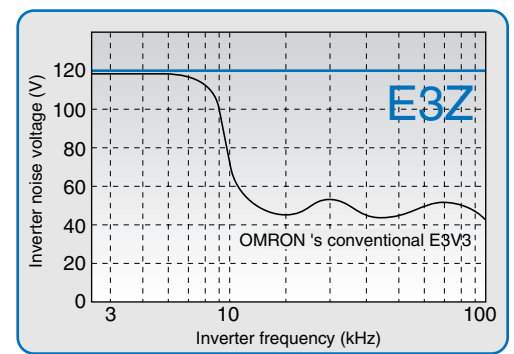
Reliability

Eliminates the influence of installation and on-site conditions, thus increasing the reliability of the line.

Highly water and dust-resistant and ensures easy installation in any location.



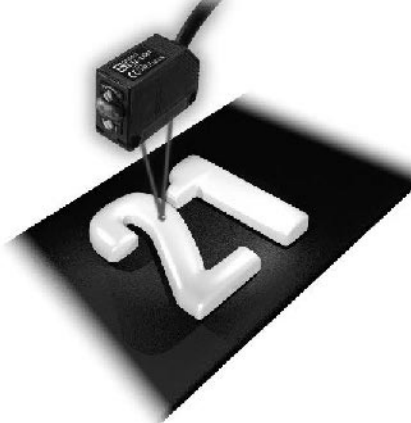
Resists common-mode noise generated by inverters.



Stability

E3Z-series reliability covers a wide range of object/background combinations, and ensure stable detection regardless of work-piece color or glossiness.

Foreground Suppression & Background Suppression

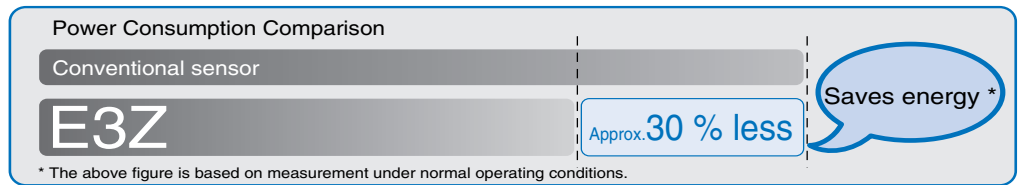


Environmental protection

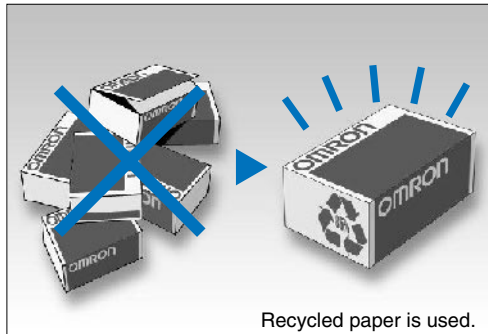
Photoelectric Sensor with Built-in Amplifier



Earth-friendly energy-saving type.



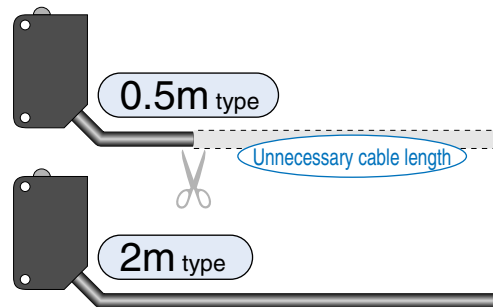
10-quantity packing reduces waste cartons.



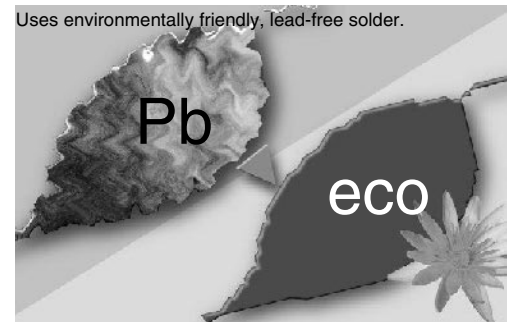
Packed in "combustible" polyethylene bags free of Styrofoam. *



Standard models provided with a 0.5-m cable are available for the elimination of unnecessary cable length.



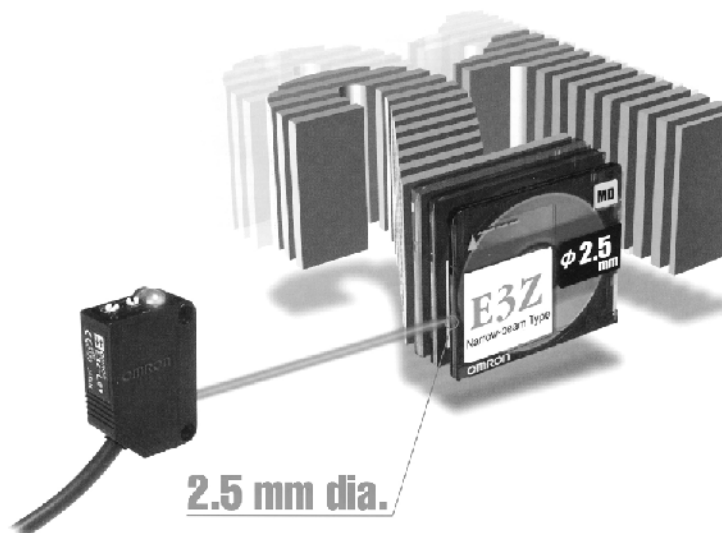
On-going elimination of materials containing lead.



Narrow Beam model

Ideal for detecting small objects with a small spot:

- Tiny objects as little as 0.1 mm in diameter can be detected with a 2.5-mm dia. spot.
- A thin beam enables detection through a gap or small hole.
- The small spot of light enables visual checking of sensing spot position.



Transparent PET bottles

Stable detection of thin-wall PET bottles adequate for recycling
Standard-size transparent object sensor

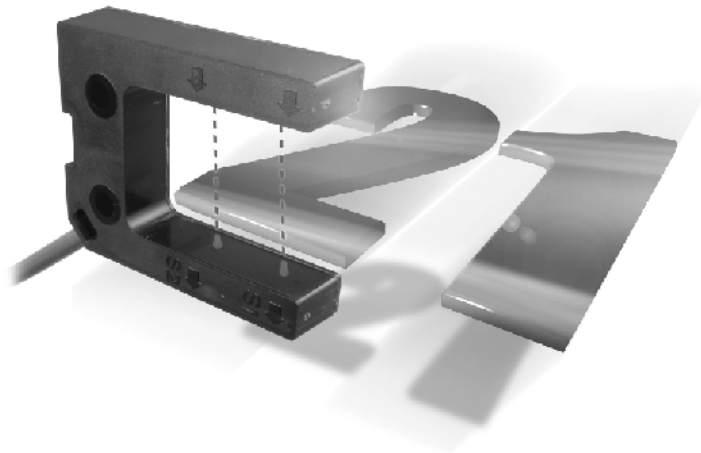
- Uses OMRON's unique optical system ("Inner View") that can detect various shapes of PET bottles and transparent objects.
- Detects a wide range of bottles from 500-ml bottles to 2-l bottles, and from single bottles to sets of stocked bottles.



Reduced adjustment

Grooved design eliminates the need for optical axis adjustment.

- Two-axis models also available..



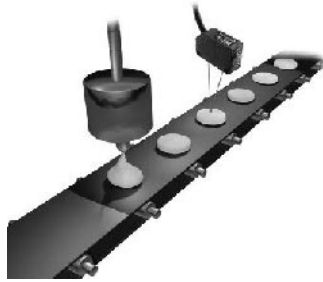
Applications

E3Z-LS background and foreground suppression models

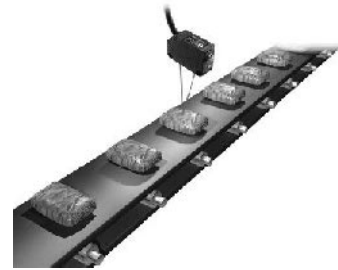
Detecting covers on cosmetic products



Detecting pastries on conveyor belts

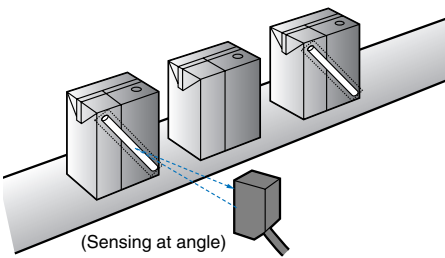


Detecting packaged chewing gum or candy

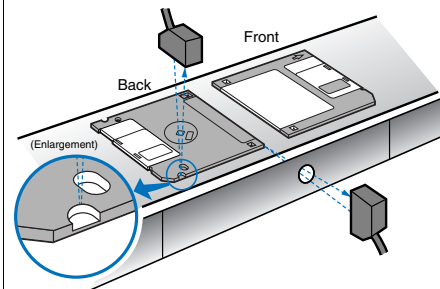


E3Z-L narrow beam models

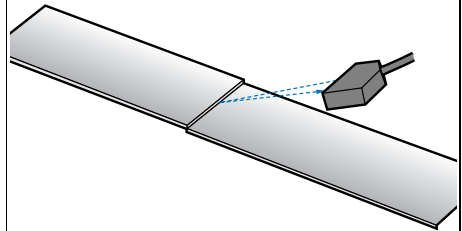
Checking for straws



Determining front/back or orientation of floppy disks

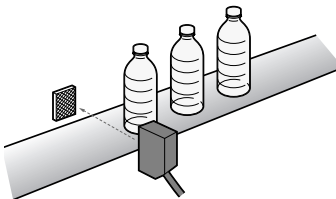


Detecting uneven joints

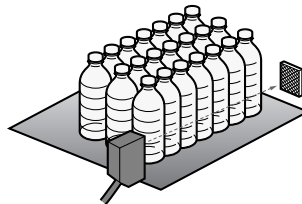


E3Z-B transparent object model

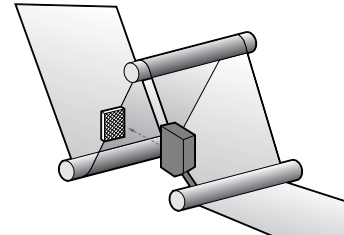
Transparent PET Bottle-related Detection - One bottle



Transparent PET Bottle related Detection - Multiple bottles (Stocker)

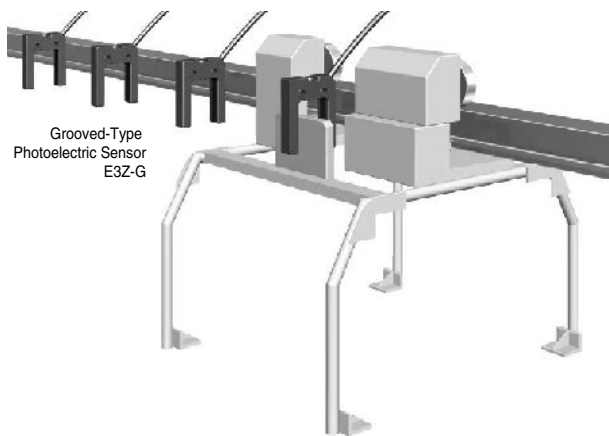


Detection of films and glass plates



E3Z-G grooved type model

Crane and automated warehouse conveyor table passage inspection and positioning.



Ordering Information

Sensors

Red light Infrared light

Sensor type	Shape	Connection method	Sensing distance	Model			
				NPN output	PNP output		
Through-beam		Pre-wired models (2 m)*3			E3Z-T61	E3Z-T81	
		Connector type			E3Z-T66	E3Z-T86	
		Pre-wired models (2 m)*3			E3Z-T61A	E3Z-T81A	
		Connector type			E3Z-T66A	E3Z-T86A	
Retroreflective model (with M.S.R. function)		Pre-wired (2 m)*3			*2	E3Z-R61	E3Z-R81
		Connector type				E3Z-R66	E3Z-R86
Diffuse-reflective		Pre-wired models (2 m)*3				E3Z-D61	E3Z-D81
		Connector type				E3Z-D66	E3Z-D86
		Pre-wired models (2 m)*3, *4				E3Z-D62	E3Z-D82
		Connector type				E3Z-D67	E3Z-D87
Thin beam type reflective model		Pre-wired models (2 m)*3				E3Z-L61	E3Z-L81
		Connector type				E3Z-L66	E3Z-L86
Distance-settable		Pre-wired models (2 m)*3				E3Z-LS61	E3Z-LS81
		Connector type				E3Z-LS66	E3Z-LS86
Transparent PET bottle type Retro-reflective model (without M.S.R. function)		Pre-wired (2 m)*3			*2	E3Z-B61	E3Z-B81
		Connector type				E3Z-B66	E3Z-B86
		Pre-wired models (2 m)*3			*2	E3Z-B62	E3Z-B82
		Connector type				E3Z-B67	E3Z-B87
Grooved type through-beam model		1				E3Z-G61	E3Z-G81
		2				E3Z-G62	E3Z-G82
		1				E3Z-G61-M3J	E3Z-G81-M3J
		2				E3Z-G62-M3J	E3Z-G82-M3J

*1. Not attached. Please purchase the optional reflector (9 types) according to your application.

*2. The sensing distance specified is possible when the E39-R1S used. Figure in parentheses indicate the minimum required distance between the Sensor and Reflector.

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

*4. The connector joint type is available M12. Its model ends with -M1. (Example: E3Z-T61-M1J)

Accessories (Order Separately)

Slits

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

Reflectors

Not provided with retroreflective models

Name	Sensing distance (typical) *	Model	Quantity	Remarks
Reflectors	3 m [100 mm] (Rated value)	E39-R1	1	for E3Z-B□1/6 for E3Z-B□2/7
	4 m [100 mm] (Rated value)	E39-R1S	1	
	500 mm [80 mm]	E39-R1S	1	
	2 m [100 mm]			
	5 m [100 mm]	E39-R2	1	
	2.5 m [100 mm]	E39-R9	1	
3.5 m [100 mm]	E39-R10	1		
Fog preventing	500 mm [80 mm]	E39-R1K	1	for E3Z-B□1/6 for E3Z-B□2/7
	2 m [100 mm]			
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	

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Note: 1 . When using the reflector of other than the rated value, set the sensing distance to about 0.7 times of the typical example as a guideline.

2 . For details, refer to the "Reflector list".

Mutual interference prevention filter

Sensing distance	Shape/dimensions	Model	Quantity	Remarks
3 m		E39-E11	2 sets each for emitters and receivers (total of 4 pcs.)	Can be used with the through-beam E3Z-T□□A. The arrow represents the polarizing direction. Changing the polarizing direction of the two adjacent emitters and receivers prevents mutual interference.





Mounting Brackets

Shape	Model	Quantity	Remarks	Shape	Model	Quantity	Remarks
	E39-L153	1	Mounting Brackets		E39-L150	One set	Sensor adjuster Easy mounting to aluminum frame/rail of conveyor or like, easy adjustment. For left-to-right adjustment
	E39-L104	1			E39-L151	One set	
	E39-L43	1	Horizontal type mounting bracket		E39-L93	One set	
	E39-L142	1	Horizontal type protective cover bracket		E39-L144	1	Vertical protective cover bracket
	E39-L44	1	Rear mounting bracket				
	E39-L98	1	Protective cover bracket				

Note: 1 . If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.

2 . For details, refer to the "Mounting bracket list".

Sensor I/O Connectors

Size	Cable type	Shape	Cable length		Model	
M8	Standard cable	Straight		2 m	4-wire type	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)		Straight		2 m	3-wire type	XS2F-D421-DC0-A
				5 m		XS2F-D421-GC0-A
		L-shaped		2 m		XS2F-D422-DC0-A
				5 m		XS2F-D422-GC0-A

Rating/performance

Sensor type		Through-beam		Retroreflective model (with M.S.R. function)	Diffuse-reflective	
					wide-beam	
Item	NPN output	E3Z-T61/T66	E3Z-T61A/T66A	E3Z-R61/R66	E3Z-D61/D66	E3Z-D62/D67
	PNP output	E3Z-T81/T86	E3Z-T81A/T86A	E3Z-R81/R86	E3Z-D81/D86	E3Z-D82/D87
Sensing distance		15 m	10 m	4 m (100 mm) * (When using the E39-R1S) 3 m (100 mm) * (When using the E39-R1)	100 mm (White paper 100 x 100 mm)	1 m (White paper 300 x 300 mm)
Setting range		---				
Reflectivity characteristic		---				
Spot Diameter		---				
Standard sensing object		Opaque: 12-mm dia. min.		Opaque: 75-mm dia. min.	---	
Min. sensing object		---				
Differential distance		---			20% max. of sensing distance	
Directional angle		Both emitter and receiver: 3° to 15°	Both emitter and receiver: 3° to 5°	2° to 10°	---	
Light source (wave length)		Infrared LED (860 nm)	Red LED (700 nm)	Red LED (680 nm)	Infrared LED (860 nm)	
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) : 10% max.				
Current consumption		emitter: 15 mA receiver: 20 mA		30 mA max.		
Control output		Load power supply voltage 26.4 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON switch selectable				
BGS / FGS selection		---				
Protective circuits		Protection from load short-circuit and reversed power supply connection		Reverse polarity protection, output short-circuit protection, mutual interference prevention		
Response time		Operation or reset: 1 ms max.				
Sensitivity adjustment		Single-turn adjustment				
Ambient illuminance		Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.				
Ambient temperature		Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)				
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)				
Insulation resistance		20 M Ω min. at 500 VDC				
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute				

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Rating/performance

Diffuse-reflective narrow-beam	Distance-settable	Retro-reflective for PET bottles (without MSR function)		Grooved-type	
			wide-beam		
E3Z-L61/66	E3Z-LS61/66	E3Z-B61/66	E3Z-B62/67	E3Z-G61	E3Z-G62
E3Z-L81/86	E3Z-LS81/86	E3Z-B81/86	E3Z-B82/87	E3Z-G81	E3Z-G82
90 ± 30 mm (White paper 100 x 100 mm)	BGS: White or black paper (100 x 100 mm): 20 mm to set distance FGS: White paper (100 x 100 mm): Set distance to 200 mm min. Black paper (100 x 100 mm): Set distance to 160 mm min.	500 mm (80 mm) * (When using the E39-R1S)	2 m (100 mm) * (When using the E39-R1S)	25 mm 1 optical axis 2 optical axis	
---	White paper (100 x 100 mm): 40 to 200 mm Black paper (100 x 100 mm): 40 to 160 mm	---			
Refer to the diagram „Hysteresis Difference vs. Sensing Distance“	Black/white-error: 10% of set distance max.	---			
2.5 mm dia. (when sensing distance is 90 mm)	---				
---	Transparent round PET bottle 500 ml (65 mm dia.)		---		
0.1 mm dia. (copper wire)					

Red LED (660 nm)	Red LED (680 nm)	Red LED (680 nm)	Infrared LED (860 nm)		
12 to 24 VDC ±10%, ripple (p-p) : 10% max.					
30 mA max				25 mA max.	40 mA max.
Load power supply voltage 26.4 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON switch selectable					
---	BGS: Open or connected to GND FGS: Connected to Vcc	---			
Reverse polarity protection, output short-circuit protection, mutual interference prevention					
Operation or reset: 1 ms max.					
Single-turn adjustment	five-turn endless adjuster	Single-turn adjustment		---	
Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.					
Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)					
Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)					
20 MΩ min. at 500 VDC					
1,000 VAC at 50/60 Hz for 1 minute					

Rating/performance

Sensor type		Through-beam		Retroreflective model (with M.S.R. function)	Diffuse-reflective		
					wide-beam		
Item	Model	NPN output	E3Z-T61/T66	E3Z-T61A/T66A	E3Z-R61/R66	E3Z-D61/D66	E3Z-D62/D67
		PNP output	E3Z-T81/T86	E3Z-T81A/T86A	E3Z-R81/R86	E3Z-D81/D86	E3Z-D82/D87
Vibration resistance		10 to 55 Hz, 1.5-mm or 300m/s ² double amplitude for 2 hours each in X, Y, and Z directions					
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions					
Protective structure		IEC 60529 IP67					
Connection method		Pre-wired (standard length: 2 m/500 mm)/M8 connector					
Indicator lamp		Operation indicator (orange), stability indicator (green) [Note that the emitter has the power indicator (orange) only]					
Weight (Packed state)	Pre-wired models (with 2-m cable)	Approx. 120 g			65 g		
	Connector type	30 g			Approx. 20 g		
Material	Case	PBT (polybutylene terephthalate)					
	Lens	Methacrylate resin					
Accessories		Instruction manual (The Reflector or Mounting Bracket is not provided with any of the above models.)					

Rating/performance

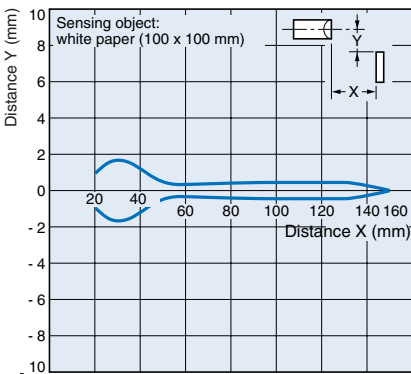
Diffuse-reflective narrow-beam	Distance-settable	Retro-reflective for PET bottles (without MSR function)		Grooved-type	
			wide-beam		
E3Z-L61/66	E3Z-LS61/66	E3Z-B61/66	E3Z-B62/67	E3Z-G61	E3Z-G62
E3Z-L81/86	E3Z-LS81/86	E3Z-B81/86	E3Z-B82/87	E3Z-G81	E3Z-G82
10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions					
Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions					
IEC 60529 IP67				IEC 60529 IP64	
Pre-wired (standard length: 2 m/500 mm)/M8 connector				Pull-out cable type (standard cable length: 2 m/500 mm) / connector relay type (standard cable length: 300 mm)	
Operation indicator (orange), stability indicator (green)				Operation indicator (orange)	
Approx. 65 g		65 g			
Approx. 20 g				30 g	
PBT (polybutylene terephthalate)				ABS	
Methacrylate resin	Denaturated polyallylate		Methacrylate resin		
Instruction manual (The Reflector or Mounting Bracket is not provided with any of the above models.)					

Characteristic data (typical)

Operating Range

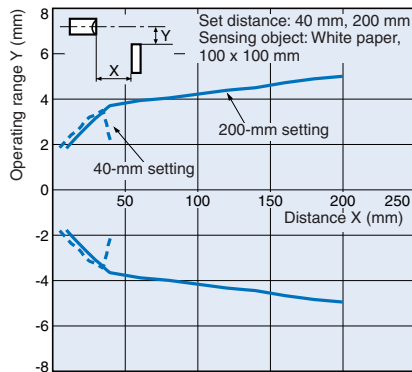
Narrow-beam

E3Z-L



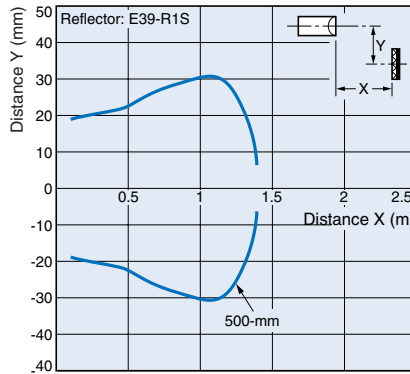
Distance-setting

E3Z-LS [BGS]

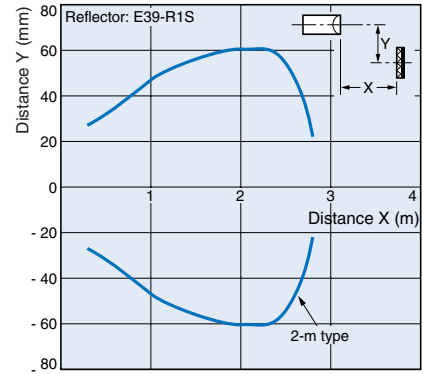


Retroreflective Models for transparent objects

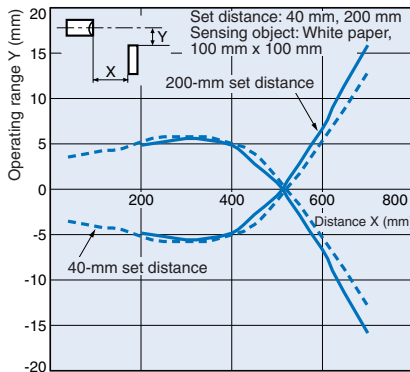
E3Z-B□1/B□6 + E39-R1S (optional reflector)



E3Z-B□2/B□7 + E39-R1S (optional reflector)



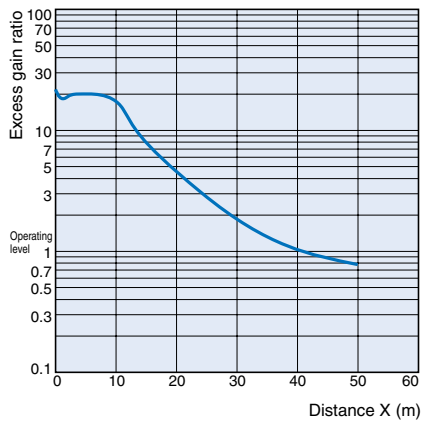
E3Z-LS [FGS]



Excess Gain vs. Distance

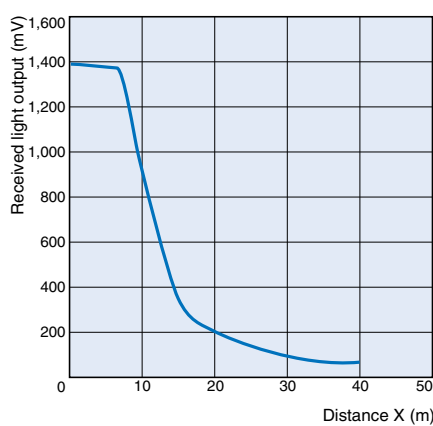
Through-beam

E3Z-T□1(T□6)



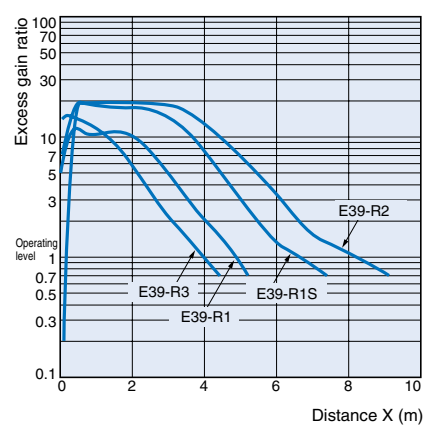
Through-beam

E3Z-T□A

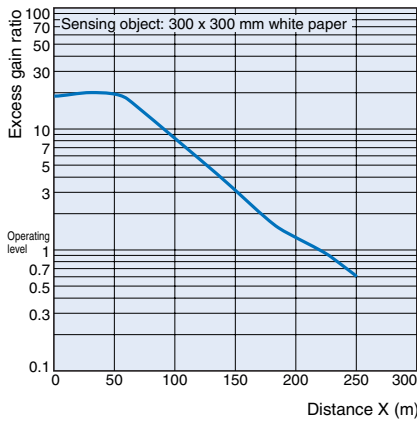


Retroreflective Models

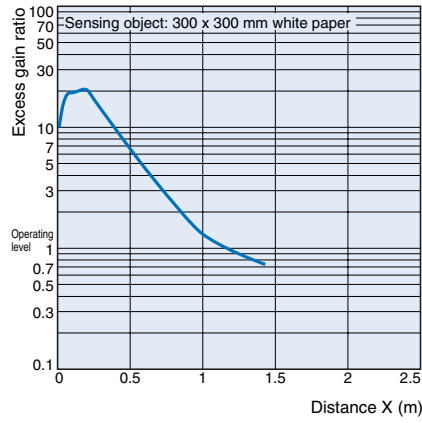
E3Z-R□1(R□6) + Reflectors



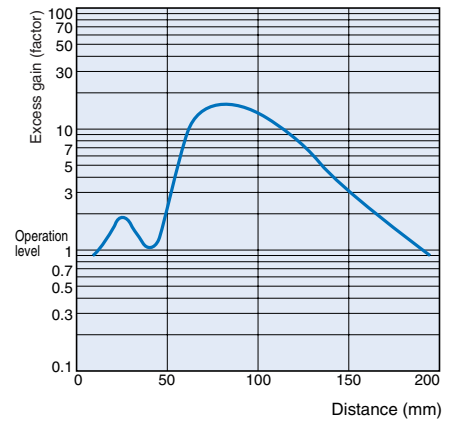
Diffuse-reflective
E3Z-D□1(D□6)



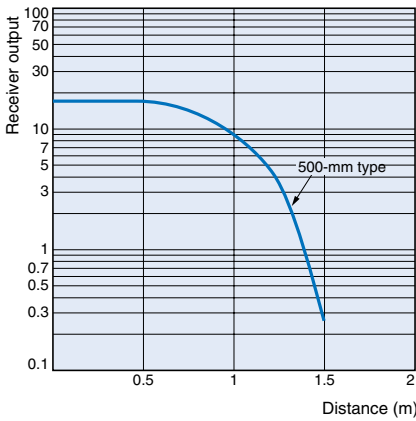
Diffuse-reflective
E3Z-D□2(D□7)



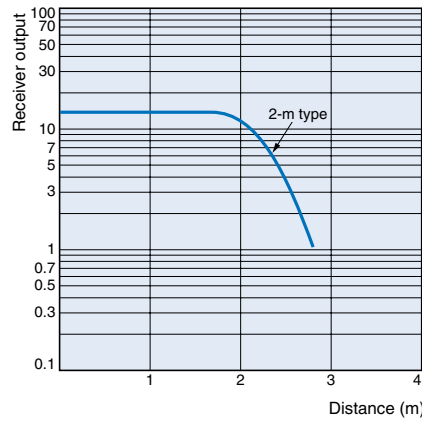
Narrow-beam
E3Z-L



Retro-reflective for transparent objects
E3Z-B□1/B□6 + E39-R1S
(optional reflector)

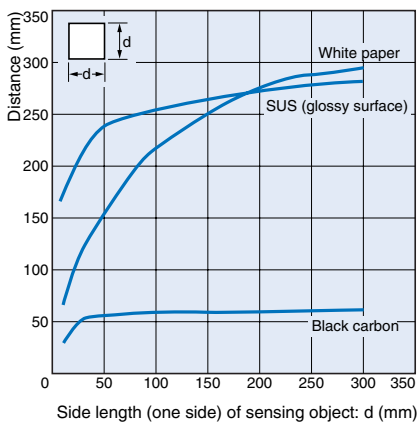


E3Z-B□2/B□7 + E39-R1S
(optional reflector)

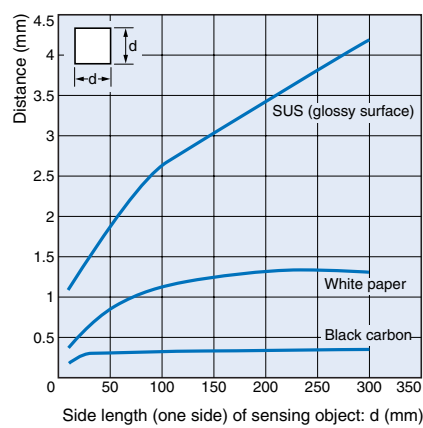


Distance vs. Size

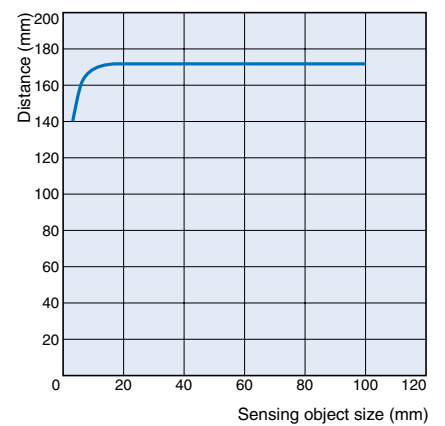
Diffuse-reflective
E3Z-D□1(D□6)



Diffuse-reflective
E3Z-D□2(D□7)



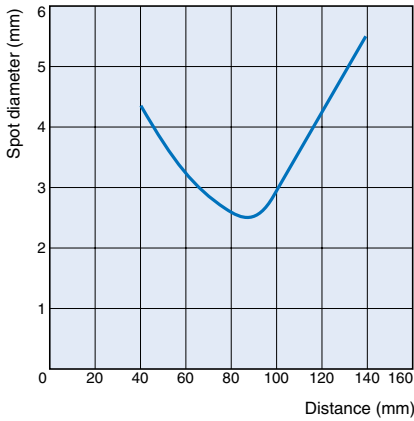
Narrow-beam
E3Z-L



Spot diameter vs. Distance

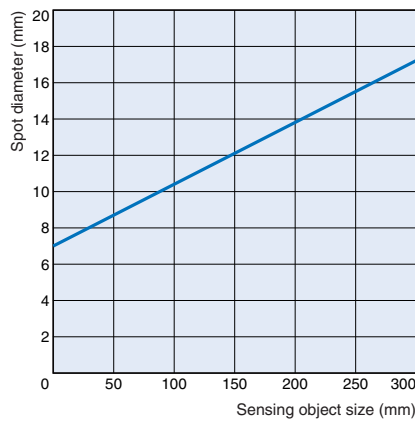
Narrow-beam

E3Z-L



Distance setting

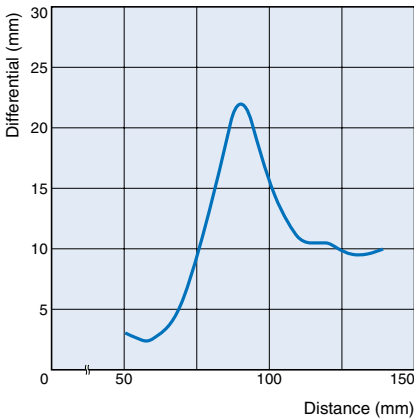
E3Z-LS



Differential travel / Hysteresis vs. Distance

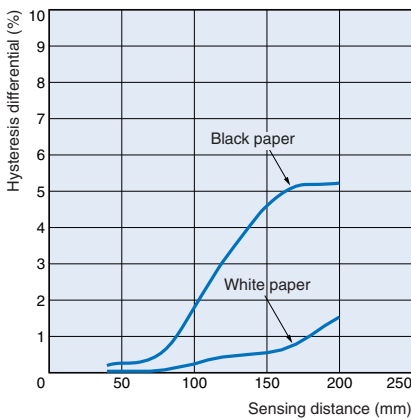
Narrow-beam

E3Z-L



Distance setting

E3Z-LS

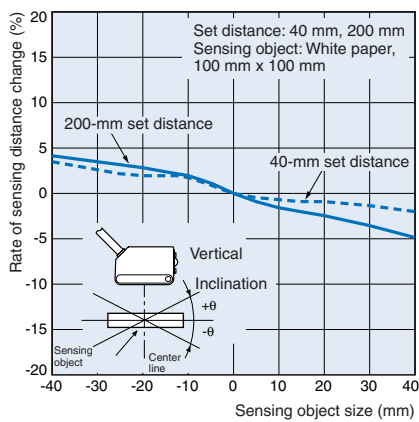


Inclination Characteristics

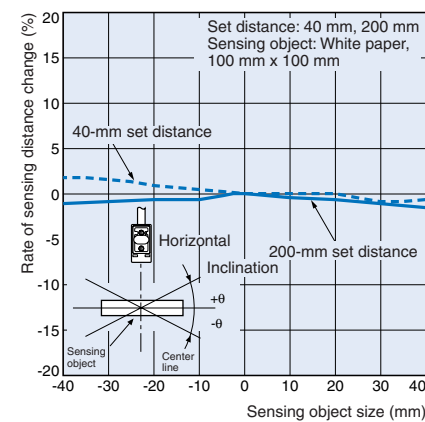
Distance setting

E3Z-LS

Vertical



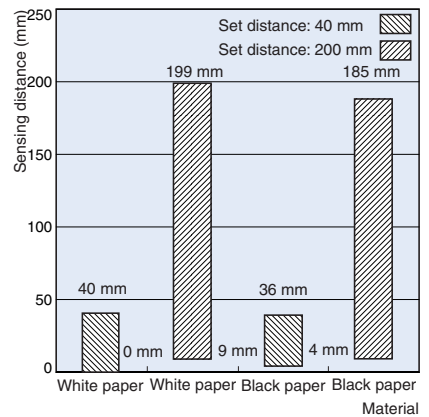
Horizontal



Short-distance Characteristics

Distance setting

E3Z-LS

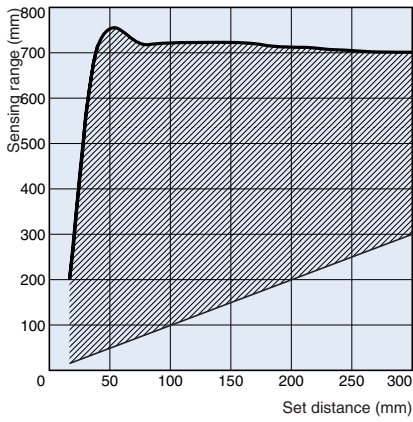


FGS Mode Set Distance vs. Sensing Range

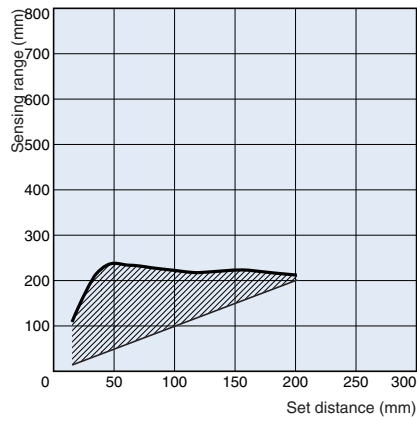
Distance setting

E3Z-LS

White Paper



Black Paper

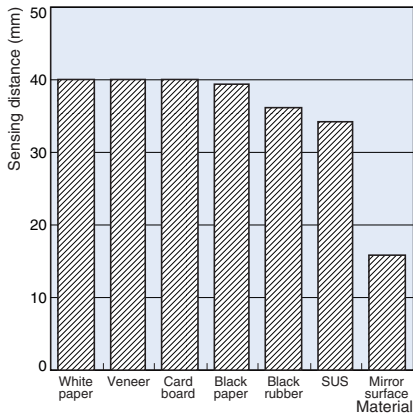


Sensing Distance vs. Material

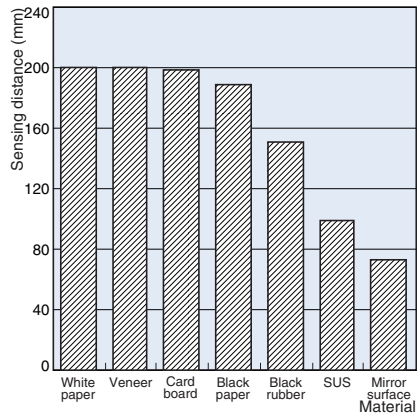
Distance setting

E3Z-LS

At Set Distance of 40 mm



At Set Distance of 200 mm



Output Circuit Diagram

NPN output

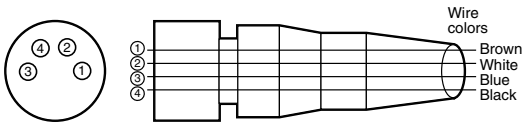
Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3Z-T61 E3Z-T66 E3Z-T61A E3Z-T66A E3Z-R61 E3Z-R66 E3Z-D61 E3Z-D66 E3Z-D62 E3Z-D67 E3Z-L61 E3Z-L66 E3Z-B61 E3Z-B62 E3Z-B66 E3Z-B67 E3Z-G61	Light ON		L•ON (LIGHT ON)	<p>Through-beam receiver Retroreflective model Diffuse-reflective model</p>
	Dark ON		D•ON (DARK ON)	<p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>
E3Z-LS61 E3Z-LS66	Light ON		L•ON (LIGHT ON)	<p>Through-beam emitter</p> <p>Connector Pin Arrangement</p> <p>Note: Terminal 2 and 4 are not used.</p>
	Dark ON		D•ON (DARK ON)	
Light ON		L•ON (LIGHT ON)		
Dark ON		D•ON (DARK ON)		
E3Z-G62	Light ON		L•ON (LIGHT ON)	<p>Connector Pin arrangement</p>
	Dark ON		D•ON (DARK ON)	

PNP output

Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3Z-T81 E3Z-T86 E3Z-T81A E3Z-T86A E3Z-R81 E3Z-R86 E3Z-D81 E3Z-D86 E3Z-D82 E3Z-D87 E3Z-L81 E3Z-L86 E3Z-B81 E3Z-B82 E3Z-B86 E3Z-B87 E3Z-G81	Light ON		L•ON (LIGHT ON)	<p>Through-beam receiver Retroreflective model Diffuse-reflective model</p>
	Dark ON		D•ON (DARK ON)	<p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>
E3Z-LS81 E3Z-LS86	Light ON		L•ON (LIGHT ON)	<p>Through-beam emitter</p> <p>Connector Pin Arrangement</p> <p>Note: Terminal 2 and 4 are not used.</p>
	Dark ON		D•ON (DARK ON)	
E3Z-G82	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	

E3Z

Connectors (Sensor I/O connectors)



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

Class	Wire, outer jacket color	Connector pin No.	Application		
			Standard	E3Z-LS	E3Z-G62/82
For DC	Brown	①	Power supply (+V)		
	White	②	---	BGS / FGS selection	Output 2 (S2)
	Blue	③	Power supply (0 V)		
	Black	④	Output		Output 1 (S1)

Nomenclature:

Through-beam

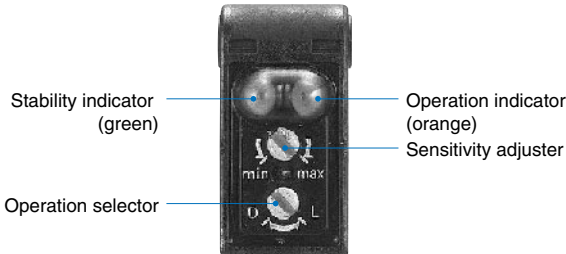
E3Z-T□□ Receiver
E3Z-T□□A Receiver

Retroreflective Models

E3Z-R□□
E3Z-B□□

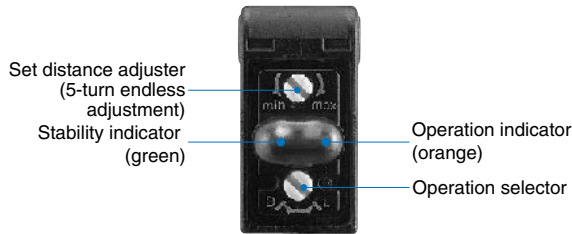
Diffuse-reflective

E3Z-D□□
E3Z-L□□



Distance-setting

E3Z-LS□□



Operation

Slit for through-beam model (Optional accessory: E39-S65A/B/C/D/E/F)

Mounting method

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

Mounting condition

Side view Front view

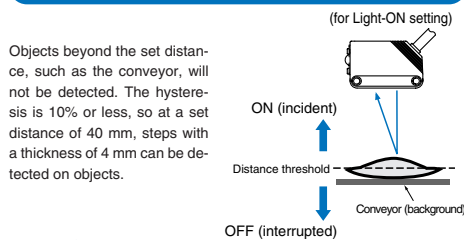
Demounting method

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

BGS / FGS Application for distance setting E3Z-LS

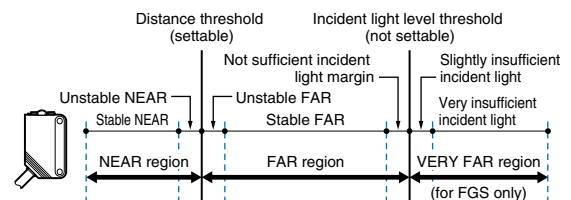
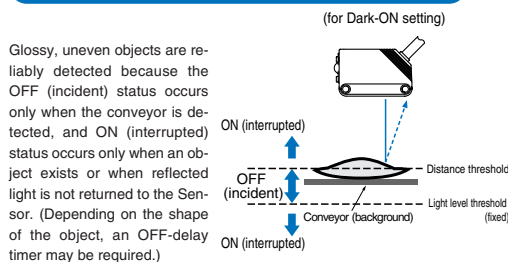
Simple Detection of Glossy, Uneven Objects

BGS (Background Suppression)



Selectable by Changing Cable Connection

FGS (Foreground Suppression)



		BGS		FGS	
L/ON	Stability (green)	ON	OFF	ON	OFF
	Operation (orange)	ON	OFF	ON	OFF
D/ON	Stability (green)	ON	OFF	ON	OFF
	Operation (orange)	ON	OFF	ON	OFF
L/ON	Stability (green)	ON	OFF	ON	OFF
	Operation (orange)	ON	OFF	ON	OFF
D/ON	Stability (green)	ON	OFF	ON	OFF
	Operation (orange)	ON	OFF	ON	OFF

Precautions

! Caution

Do not connect an AC power supply to the Sensor. If AC power (100 VAC or more) is supplied to the Sensor, it may explode or burn.

Be sure to abide by the following precautions for the safe operation of the Sensor.

Wiring

Power Supply Voltage and Output Load Power Supply Voltage

Make sure that the power supply to the Sensor is within the rated voltage range. If a voltage exceeding the rated voltage range is supplied to the Sensor, it may explode or burn.

Load Short-circuiting

Do not short-circuit the load, otherwise the Sensor may be damaged.

Connection without Load

Do not connect the power supply to the Sensor with no load connected, otherwise the internal elements may explode or burn.

Operating Environment

Do not use the Sensor in locations with explosive or flammable gas.

Correct Use

Design

Power Reset Time

The Sensor is ready to operate 100 ms after the Sensor is turned ON. If the load and Sensor are connected to independent power supplies respectively, be sure to turn ON the Sensor before supplying power to the load.

Wiring

Avoiding Malfunctions

If using the Photoelectric Sensor with an inverter or servomotor, always ground the FG (frame ground) and G (ground) terminals, otherwise the Sensor may malfunction.

Mounting

Mounting the Sensor

- If Sensors are mounted face-to-face, make sure that the optical axes are not in opposition to each other. Otherwise, mutual interference may result.
- Always install the Sensor carefully so that the aperture angle range of the Sensor will not cause it to be directly exposed to intensive light, such as sunlight, fluorescent light, or incandescent light.

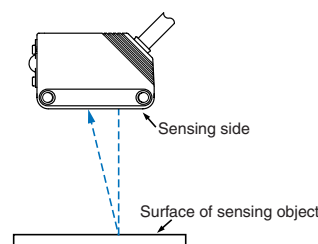
- Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will lose its water-resistive properties.
- Use M3 screws to mount the Sensor.
- When mounting the case, make sure that the tightening torque applied to each screw does not exceed 0.54 Nm.

M8 Connector

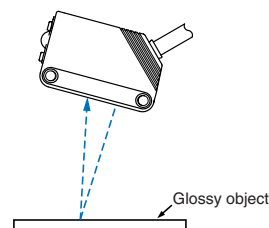
- Always turn OFF the power supply to the Sensor before connecting or disconnecting the metal connector.
- Hold the connector cover to connect or disconnect it.
- Secure the connector cover by hand. Do not use pliers, otherwise the connector may be damaged.
- If the connector is not connected securely, it may be disconnected by vibration or the proper degree of protection of the Sensor may not be maintained.

Distance setting models E3Z-LS

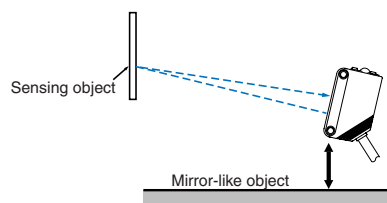
- Make sure that the sensing side of the Sensor is parallel with the surface of the sensing objects. Normally, do not incline the Sensor towards the sensing object.



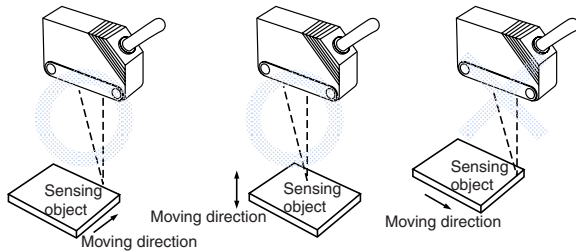
If the sensing object has a glossy surface, however, incline the Sensor by 5° to 10° as shown in the illustration, provided that the Sensor is not influenced by background objects.



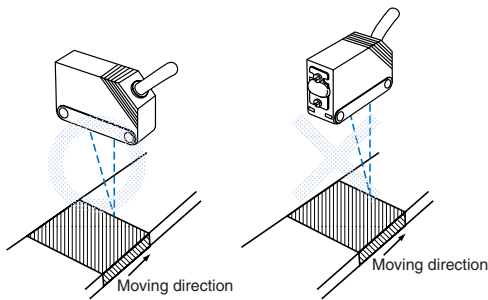
- If there is a mirror-like object below the Sensor, the Sensor may not operate stably. Therefore, incline the Sensor or separate the Sensor from the mirror-like object as shown below.



- Do not install the Sensor in the wrong direction. Refer to the following illustration.



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



Retro-reflective for transparent objects E3Z-B

Design

Bottles

The Sensor may be unable to achieve stable detection depending on the shape of bottles. Be sure to verify stable detection before using the Sensor.

Mounting

Sensor Mounting

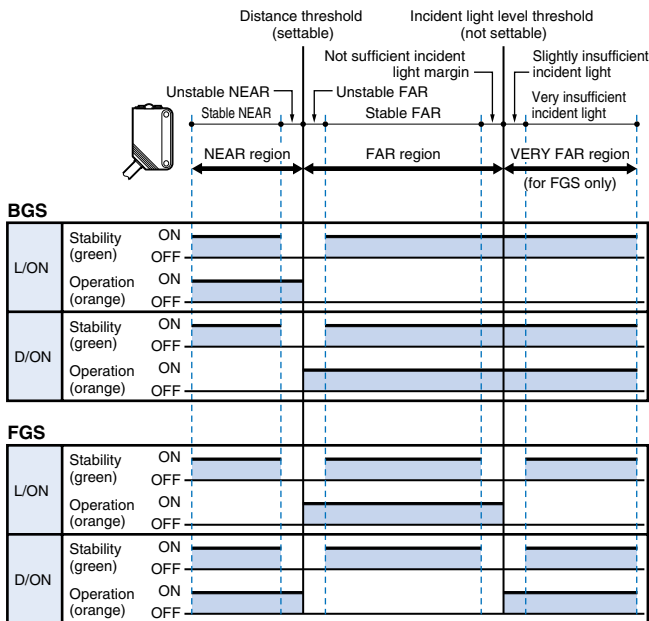
If the Sensor fails to provide stable detection due to the shape of bottles, adjust the location and inclination of the Sensor.

Inspection and Maintenance

Cleaning

Never use paint thinners or other organic solvents to clean the surface of the product.

Adjustments-indicator operation



- Note: 1. If the stability indicator is lit, the detection/no detection status is stable within the rated ambient operating temperature (-25 to 55°C).
2. The VERY FAR region is supported only for FGS. The incident light threshold is fixed and cannot be set. The distance to the incident light threshold depends on the color and gloss of the sensing object's surface.

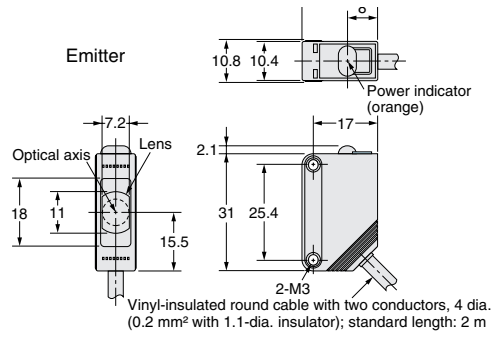
Dimensions (Unit: mm)

Sensors

Through-beam

Pre-wired

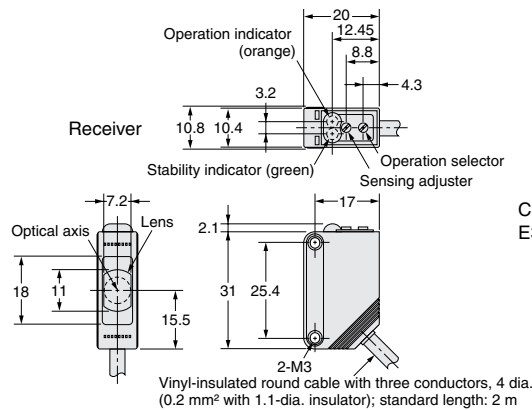
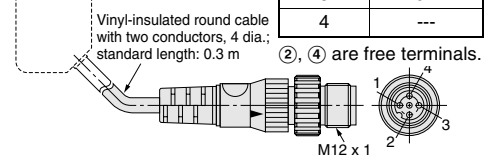
E3Z-T61
E3Z-T81
E3Z-T61A



Model	CAD file
E3Z-T61-L E3Z-T81-L	E3Z_01

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

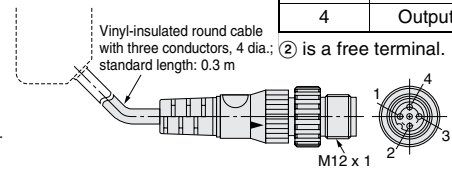
Connector relay models
E3Z-T61-M1J



Model	CAD file
E3Z-T61-L E3Z-T81-L	E3Z_02

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

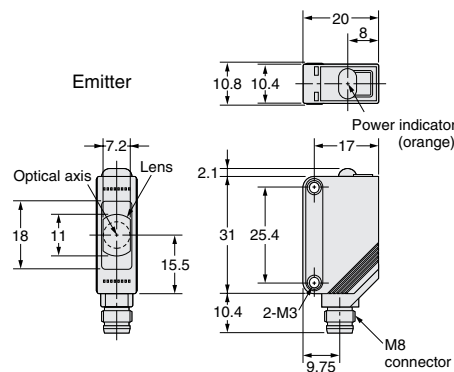
Connector relay models
E3Z-T61-M1J



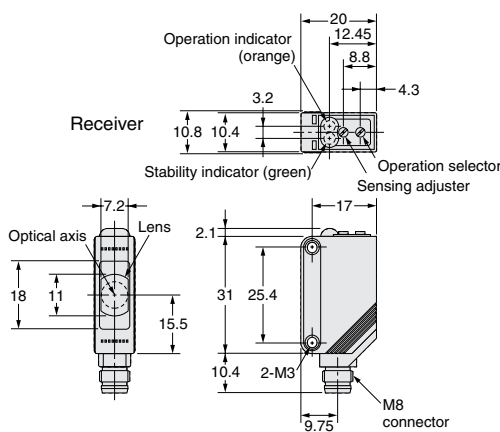
Through-beam

Connector type

E3Z-T66
E3Z-T86
E3Z-T66A



Model	CAD file
E3Z-T66-L E3Z-T86-L	E3Z_04

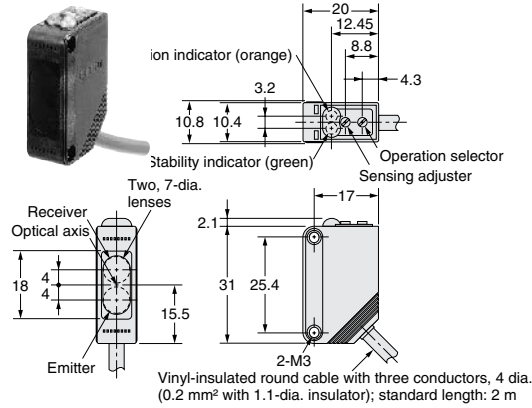


Model	CAD file
E3Z-T66-D E3Z-T86-D	E3Z_05

Retroreflective Models

Pre-wired

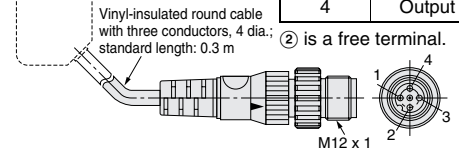
- E3Z-B61
- E3Z-B62
- E3Z-B81
- E3Z-B82
- E3Z-R61
- E3Z-R81



CAD file E3Z_03

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

Connector relay models (E3Z-□□□-M1J)



Diffuse-reflective

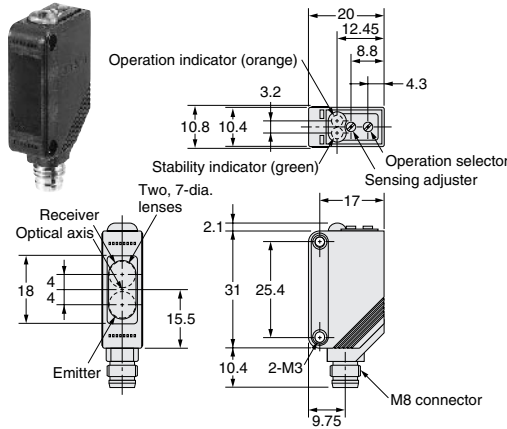
Pre-wired

- E3Z-D61
- E3Z-D81
- E3Z-D62
- E3Z-D82
- E3Z-L61
- E3Z-L81

Retroreflective Models

Connector type

- E3Z-B66
- E3Z-B67
- E3Z-B86
- E3Z-B87
- E3Z-R66
- E3Z-R86



CAD file E3Z_06

Diffuse-reflective

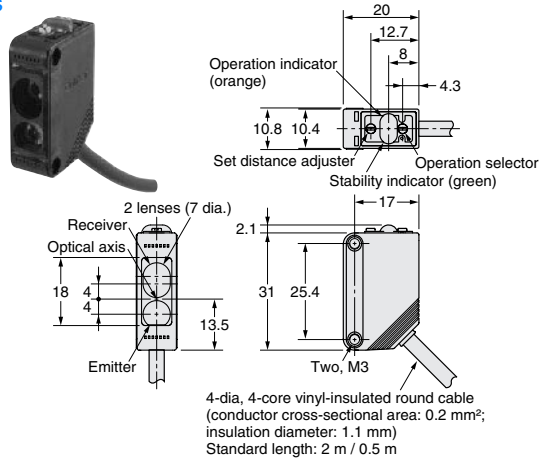
Connector type

- E3Z-D66
- E3Z-D86
- E3Z-D67
- E3Z-D87
- E3Z-L66
- E3Z-L86

Distance-settable Models

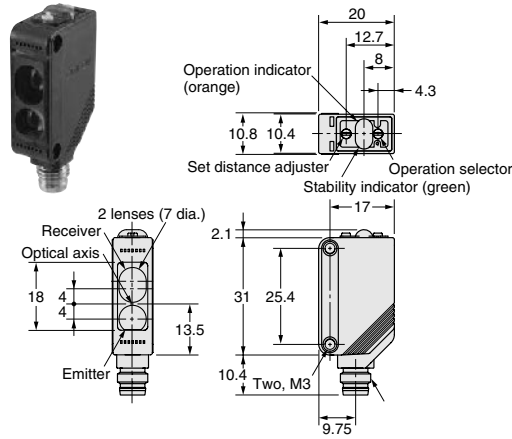
Pre-wired models

- E3Z-LS61
- E3Z-LS81



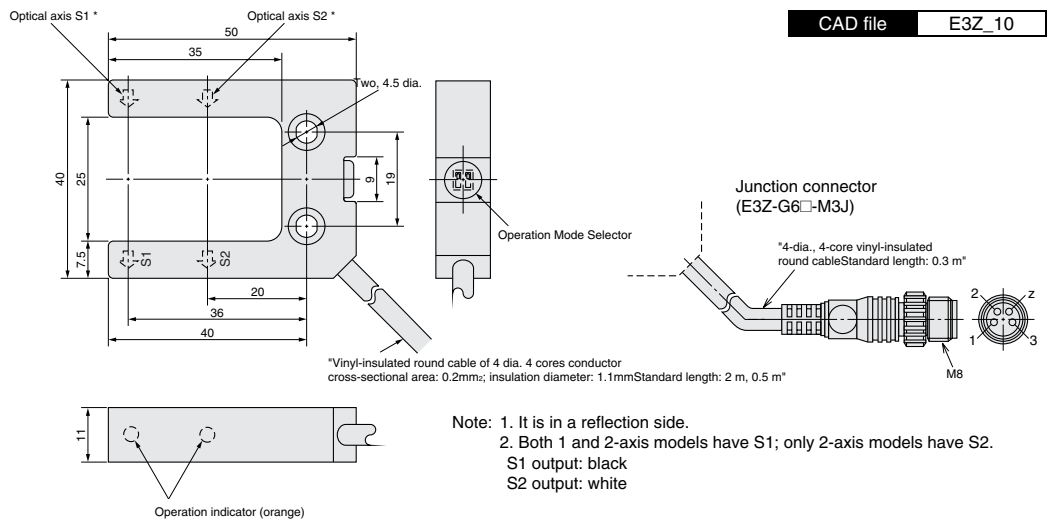
Distance-settable Models

Connector type
E3Z-LS66
E3Z-LS86



Grooved-type Models

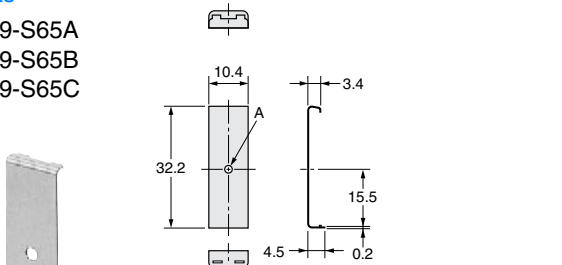
E3Z-G



Accessories (Order Separately)

Slits

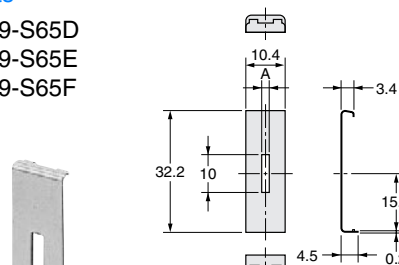
E39-S65A
E39-S65B
E39-S65C



Model	Dimension A	Material
E39-S65A	0.5-mm dia.	Stainless steel (SUS301)
E39-S65B	1.0-mm dia.	
E39-S65C	2.0-mm dia.	

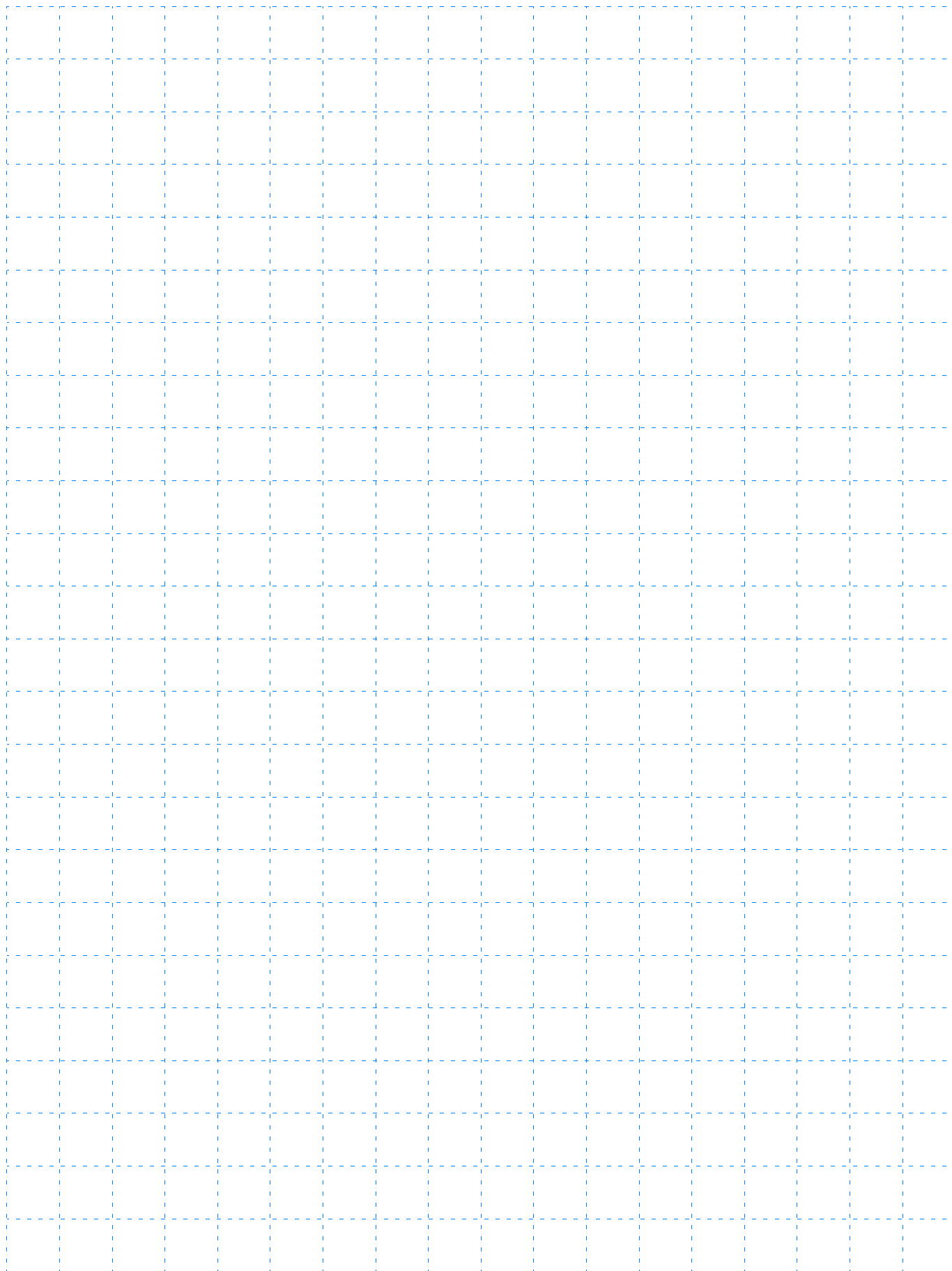
Slits

E39-S65D
E39-S65E
E39-S65F



Model	Dimension A	Material
E39-S65D	0.5	Stainless steel (SUS301)
E39-S65E	1.0	
E39-S65F	2.0	

MEMO



E3Z

Mini Photoelectric Sensor

E3T

With its built-in, ultra-small amplifier, this photoelectric sensor has achieved long, 1 m distance detection. Line-ups of 4 types are available for selection according to applications

**Features**

4 detection methods for selection according to work and space

Through-beam model

The side-view type has realized long, 1 m distance detection. Furthermore, it can detect a small, 0.5 mm or less dia. work with a pin-point beam (when slit is fitted). The visible light spot and narrow-visibility beam ensure a stable detection of lead frames and chip parts.

Diffuse reflective model

3.5 mm thin size and can be installed to a gap etc. The pin-point beam makes sensing position check easy, and the sensor is insensitive to the background and surrounding metal, ensuring stable detection.

Limited reflective model

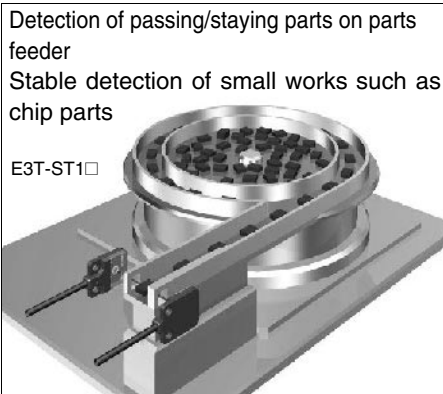
Having the smallest size, this type can detect a merely 0.15 mm small object. In addition to this, it is insensitive to the background and surrounding metal, thus, ensuring a stable detection. The pin-point beam allows a clear vision of a red light spot, facilitating a sensing position check.

Retroreflective model

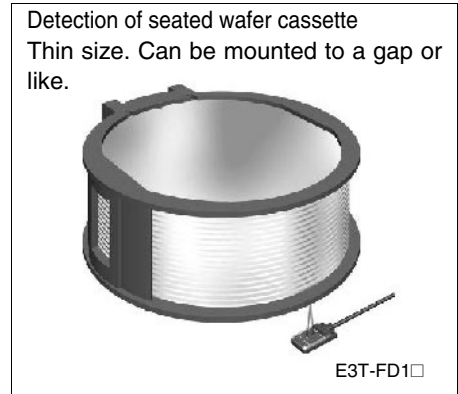
The world first coaxial Retroreflective type in this size. When used with a small reflector, this sensor completes 2 mm dia. small work detection and 200 mm sensing distance. The switch detects small works, such as IC chips on tape, and the pin-point beam makes optical axis adjustment easy, achieving stable detection.

Application

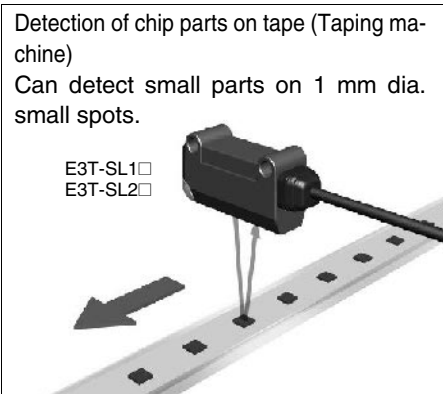
Through-beam



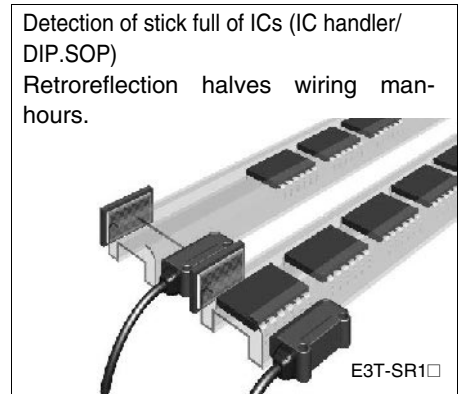
Diffuse-reflective



Limited reflective



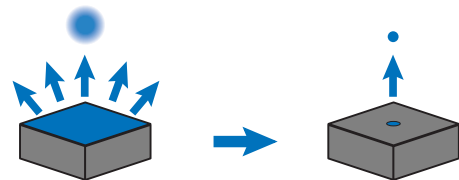
Retroreflective Models



Features

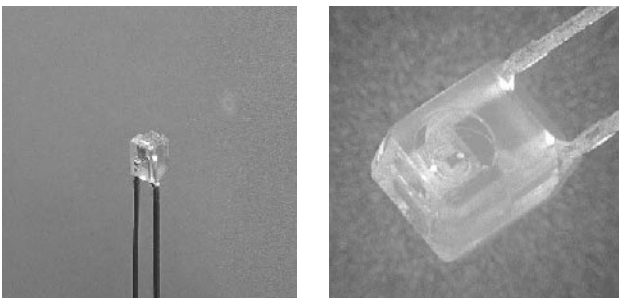
The hyper LED issues a 0.8 mm dia. pin-point beam (E3T-SL1) Small works can be detected

The hyper LED performs a high-output narrow-visibility beam of 0.8 mm spot diameter (E3T-SL1). A red spot can be seen clearly and optical axis alignment and detection position check become easy. Besides, the LED is insensitive to the work color and background and can detect a small work securely.



The conventional LED emits light from its surface. It has a large degree of light dispersion, increasing the loss when creating a small beam.

The hyper LED emits light from a small point. It has a small degree of light dispersion, achieving a loss-free, high-output, narrow-visibility beam.



High output pin-point light source LED (wave length: 670 nm)

E3S-ST	
Conventional through-beam type	

One-chip photo IC ensures high reliability.

The incident photo diode and analog/digital signal processing circuit are integrated densely into the one-chip fully customized IC in use. This photoelectric sensor has high reliability in the ultra small size.

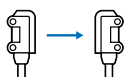



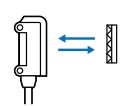






Loaded with OMRON's original FAO, this photoelectric sensor has achieved the world's first coaxial retroreflective type.

The FAO (FREE ANGLE OPTICS), or special beam splitter having multiple layers of dielectric films on a glass, has implemented the ultra small coaxial retroreflection. It can detect a small 2 mm dia. work, provides sensing position accuracy equivalent to that of the through-beam type, reducing wiring man-hours.

Ordering Information

Sensors

 Red light

Sensor type	Shape		Connection method	Sensing distance		Output form	Model	
							NPN output *1	PNP output
Through-beam	Side-view		Pre-wired models	 1m		Light ON	E3T-ST11	E3T-ST13
						Dark ON	E3T-ST12	E3T-ST14
	Flat			 500mm		Light ON	E3T-FT11	E3T-FT13
						Dark ON	E3T-FT12	E3T-FT14
Retroreflective	Side-view		 200mm [10mm] *2		Light ON	E3T-SR11	E3T-SR13	
Diffuse reflective	Flat			 5 to 30 mm		Light ON	E3T-FD11	E3T-FD13
						Dark ON	E3T-FD12	E3T-FD14
Limited reflective	Side-view			 5 to 15 mm		Light ON	E3T-SL11	E3T-SL13
						Dark ON	E3T-SL12	E3T-SL14
				 5 to 30 mm		Light ON	E3T-SL21	E3T-SL23
						Dark ON	E3T-SL22	E3T-SL24

*1. The robot cable type is available. Its type ends with "R". (Example: E3T-ST11R)

*2. Values in parentheses indicate the minimum required distance between the sensor and reflector.

Accessories (Order Separately)

Slits

Slit width	Sensing distance (typical)	Minimum sensing object (typical)	Model	Quantity	Remarks
0.5 mm dia.	100 mm	0.5 mm dia.	E39-S63	One each for Emitter and Receiver; common with Slit widths of 1 dia. and 0.5 dia.	(Plug-in type round slit) Can be used with the through-beam E3T-ST1□.
1 mm dia.	300 mm	1 mm dia.			(Plug-in type round slit) Can be used with the through-beam E3T-FT1□.
0.5 mm dia.	50 mm	0.5 mm dia.	E39-S64		(Plug-in type round slit) Can be used with the through-beam E3T-FT1□.
1 mm dia.	100 mm	1 mm dia.			

Reflectors


Name	Sensing distance (typical)	Minimum sensing object (typical)	Model	Quantity	Remarks
Small reflector	200 mm [10 mm] * (rated value)	2 mm dia.	E39-R4	1	Attached to the E3T-SR1□ Retroreflective model.
	100 mm (10 mm)*		E39-R37		---

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

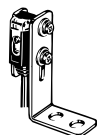
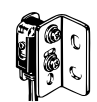



Note: 1 . When the reflector used is other than the supplied one, set the sensing distance to about 0.7 times of the typical example as a guideline.

2 . Refer to the "Reflector list".

Sensitivity Adjustment Unit

Shape	Sensing distance (typical)	Model	Quantity	Remarks
	300 to 800 mm	E39-E10	1	For E3T-ST1□

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L116	1	Can be used with the side-view E3T-S□□□.
	E39-L117		
	E39-L118		
	E39-L119		Can be used with the flat E3T-F□□□.
	E39-L120		

Note: 1. If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.
 2. For details, refer to "Mounting bracket list".

Rating/performance

Sensor type	Through-beam				Retroreflective Models		Diffuse-reflective		Limited reflective				
	Side-view		Flat		Side-view		Flat		Side-view				
	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	
Model Item	Light-ON	E3T-ST11	E3T-ST13	E3T-FT11	E3T-FT13	E3T-SR11	E3T-SR13	E3T-FD11	E3T-FD13	E3T-SL11	E3T-SL13	E3T-SL21	E3T-SL23
	Dark-ON	E3T-ST12	E3T-ST14	E3T-FT12	E3T-FT14	E3T-SR12	E3T-SR14	E3T-FD12	E3T-FD14	E3T-SL12	E3T-SL14	E3T-SL22	E3T-SL24
Sensing distance	1 m (sensitivity adjustment unit usable)		500 mm		200 mm [10 mm]* (When E39-R4 is used)		5 to 30 mm (white paper 50x50 mm)		5 to 15 mm (white paper 50x50 mm)		5 to 30 mm (white paper 50x50 mm)		
Standard sensing object	Opaque, 2dia. min.		Opaque, 1.3dia. min.		Opaque, 27dia. min.		---						
Minimum sensing object (typical)	Opaque, 2dia. min.		Opaque, 1.3dia. min.		2 dia. (Sensing distance 100 mm)		0.15 dia. (Sensing distance 10 mm)						
Differential distance	---						6 mm max.		2 mm max.		6 mm max.		
Directional angle	Emitter: 2° to 20° Receiver: 2° to 70°		Emitter: 3° to 20° Receiver: 3° min.		2° to 20°		---						
Light source (wave length)	Red light emitting diode (pin-point light source LED) (670 nm)												
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p) : 10% max.							24 VDC ±10%	12 to 24 VDC ±10%, ripple (p-p) : 10% max.				
Current consumption	Emitter/Receiver: 12 mA max.				20 mA max.								
Control output	Load power supply voltage 26.4 VDC max., load current 50 mA max. (residual voltage 1 V max.) Open collector output type Light-ON/Dark-ON depends on the format												
Protective circuits	Protection from reversed power supply connection and output short-circuit				Reverse polarity protection, output short-circuit protection, mutual interference prevention								
Response time	Operation or reset: 1 ms max.												
Ambient illuminance	(on Receiver lens) Incandescent lamp: 5,000 lux max. Sunlight: 10,000 lux max.												
Ambient temperature	Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)												
Ambient humidity	Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)												
Insulation resistance	20 M Ω min. at 500 VDC												
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute												
Vibration resistance	Destruction: 10 to 2,000 Hz, 1.5 mm double amplitude or 300 m/s ² (approx. 30G) for 0.5 hrs each in x, y, and Z directions												
Shock resistance	1000 m/s ² (approx. 100G) 3 times each in X, Y, and Z directions												
Protective structure	IEC 60529 IP67												
Connection method	Pre-wired models (standard length: 2 m)												
Weight (Packed state)	Approx. 40g				Approx. 20 g								

Model Item	Sensor type	Through-beam				Retroreflective Models		Diffuse-reflective		Limited reflective			
	Shape	Side-view		Flat		Side-view		Flat		Side-view			
	Output system	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
	Light-ON	E3T-ST11	E3T-ST13	E3T-FT11	E3T-FT13	E3T-SR11	E3T-SR13	E3T-FD11	E3T-FD13	E3T-SL11	E3T-SL13	E3T-SL21	E3T-SL23
Dark-ON	E3T-ST12	E3T-ST14	E3T-FT12	E3T-FT14	E3T-SR12	E3T-SR14	E3T-FD12	E3T-FD14	E3T-SL12	E3T-SL14	E3T-SL22	E3T-SL24	
Material	Case	PBT (polybutylene terephthalate)											
	Lens, display window	Polycarbonate											
Accessories	Cross-shaped recess screw (side view: M2x14, flat type: M2x8), nut, spring washer, flat washer, instruction manual, reflector (Retroreflective type only)												

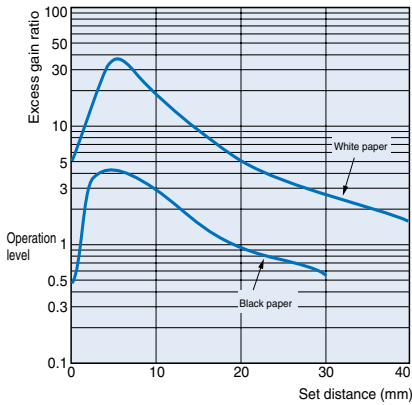
* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Characteristic data (typical)

Operating Range

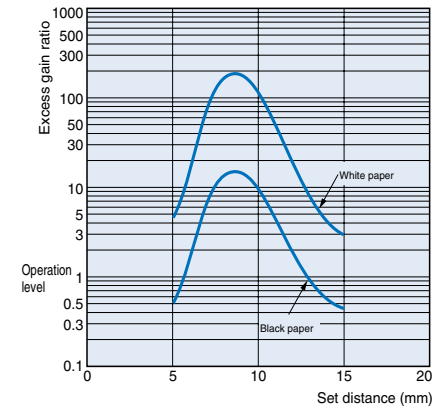
Diffuse-reflective

E3T-FD1□



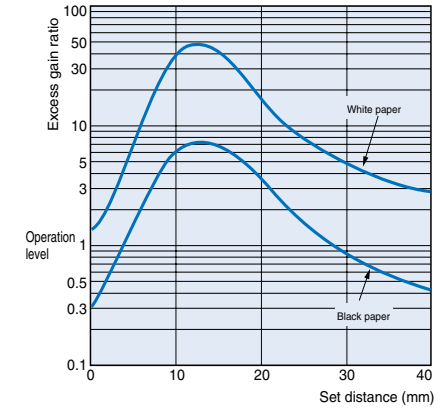
Limited reflective

E3T-SL1□



Limited reflective

E3T-SL2□



Output Circuit Diagram

NPN output

Model	Operating status of output transistor	Timing chart	Output circuit
E3T-□□□1	Light ON	<p>Incident Interrupted</p> <p>Operation indicator (orange) OFF</p> <p>Output transistor ON</p> <p>Load (Relay) Operate</p> <p>Release (Between brown and black)</p>	<p>Receiver (Through-beam Models) Retroreflective, Diffuse Reflective, and Limited Reflective Models</p>
E3T-□□□2	Dark ON	<p>Incident Interrupted</p> <p>Operation indicator (orange) ON</p> <p>Output transistor ON</p> <p>Load (Relay) Operate</p> <p>Release (Between brown and black)</p>	<p>Emitter (Through-beam Models)</p>

PNP output

Model	Operating status of output transistor	Timing chart	Output circuit
E3T-□□□3	Light ON	<p>Incident Interrupted</p> <p>Operation indicator (orange) ON</p> <p>Output transistor ON</p> <p>Load (Relay) Operate</p> <p>Release (Between brown and black)</p>	<p>Receiver (Through-beam Models) Retroreflective, Diffuse Reflective, and Limited Reflective Models</p>
E3T-□□□4	Dark ON	<p>Incident Interrupted</p> <p>Operation indicator (orange) OFF</p> <p>Output transistor ON</p> <p>Load (Relay) Operate</p> <p>Release (Between brown and black)</p>	<p>Emitter (Through-beam Models)</p>

Note: E3T-FD13/14 is power supply voltage 12 to 24 VDC ± 10%

Precautions

Warning

Do not connect to the AC power supply. Doing so can cause burst.



Correct Use

Wiring Considerations

The maximum power supply voltage is 24 VDC+10%. Before switching power on, make sure that the power supply voltage is not more than the maximum voltage.

Load short-circuit protection

This model has load short-circuit protection. If load short-circuit or like has occurred, the output turns OFF. Therefore, re-examine the wiring and switch power on again. This resets the short-circuit protection circuit. Load short-circuit protection is activated when a current of 2.4 times or more of the rated load current flows. When using an L load, use the one the inrush current of which is less than 2.4 times of the rated load current.

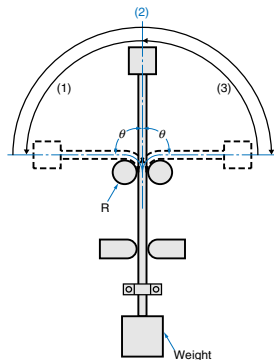
Mounting

Note that for the installation of the photoelectric sensor, hammering it will damage the water resistance function. Tighten the sensor with M2 screws via flat washers or spring washers. (Tightening torque: 0.15 Nm max.)

Ideal for mounting on moving sections

For mounting of the photoelectric sensor to a moving section such as a robot hand, examine the model that uses a flexing-resistant cable (robot cable).

While the flexing resistance of the standard cable is about 14 thousand times, that of the robot cable is as excellent as about 400 thousand times.



Cable bending rupture test (tough wire breaking test)

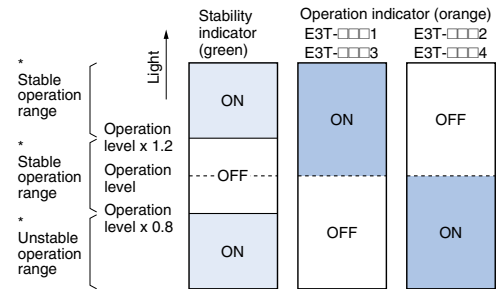
With a current flowing, "bending" is repeated to check the "number of bendings" until the current is shut off.

Test	Specimen	Standard cable 2.4 mm dia. (7/0.127 mm dia.), 3 cores	Robot cable 2.4 mm dia. (20/0.08 mm dia.), 3 cores
Contents/conditions	Bending angle (θ)	90° each to left and right	
	Bending speed	50 times/min	
	Load	200 g	
	Operation per bending	Once in 1 to 3 in the figure	
	Curvature radius of support point (R)	5 mm	
Result		About 14,000 times	About 400,000 times

For adjustment

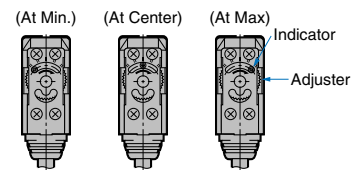
Display

- The following graphs indicate the status of each operation level.
- Be sure to use the E3T within the stable operating range.



Note: If the E3T's operation level is set to the stable operation range, the E3T will be in most reliable operation without being influenced by temperature change, voltage fluctuation, dust, or setting change. If the operation level cannot be set to the stable operation range, pay attention to environmental changes while operating the E3T.

Use of E39-E10 Sensitivity Adjustment Unit (Dark ON: E3T-ST12)



- Install the Unit on the Receiver.
- Set the adjustment dial of the sensitivity adjustment unit to Max. (Factory set to the Max. position)
- After Sensor installation adjust the optical axis and secure the Sensor.
- Place a work between the emitter and receiver, gradually turn the adjustment dial of the sensitivity unit to the Min position (CCW), and stop turning it when the operation indicator is turned ON and the stability indicator (green) is turned ON.
- Remove the work and confirm that the operation indicator is turned OFF and the stability indicator (green) is turned ON. This completes the adjustment.

Note: If the light attenuation rate due to a work is 40% or less, the stability indicator is not turned ON whether or not light is received. When the variation of light is small (e.g. when sensing semi-transparent works), carefully perform preliminary testing.

Others

Do not install the E3T in the following places.

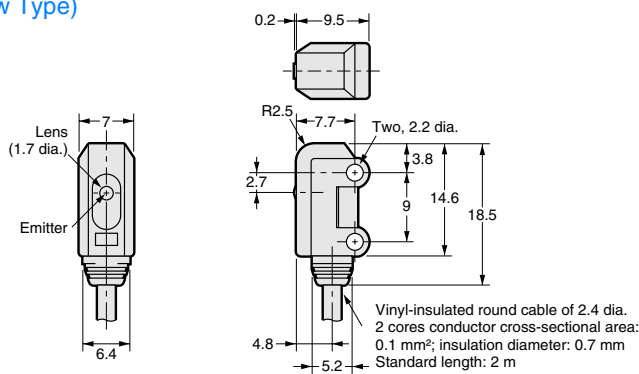
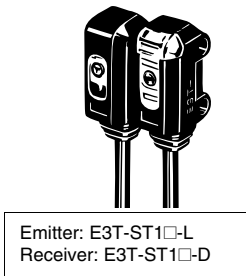
- Places where the E3T is exposed to direct sunlight.
- Places with high humidity and where condensation may result.

Dimensions (Unit: mm)

Sensors

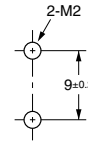
Through-beam Models (Side-view Type)

E3T-ST1□ (Emitter)

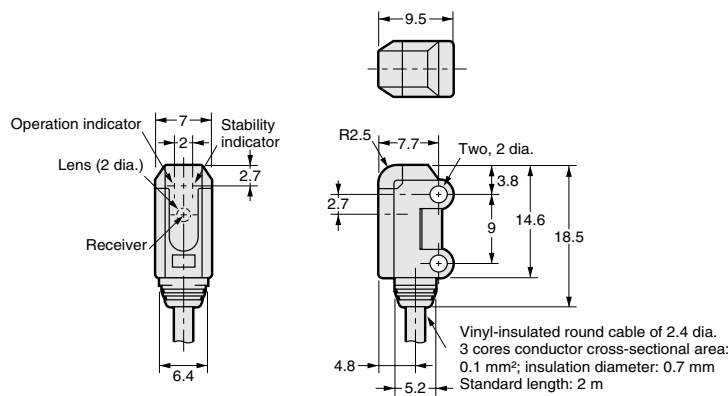


CAD file	E3T_04
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Mounting Holes

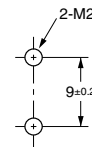


E3T-ST1□ (Receiver)



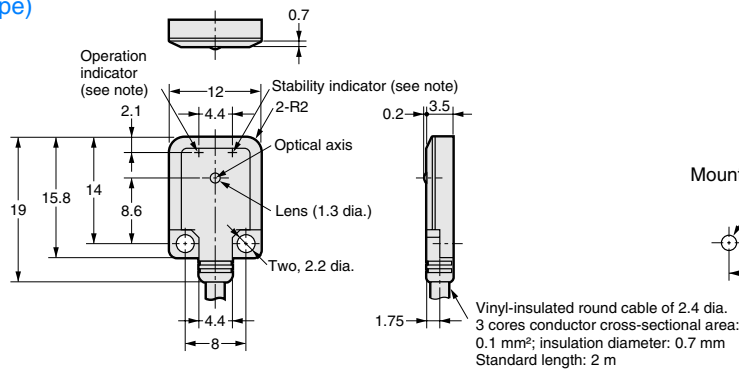
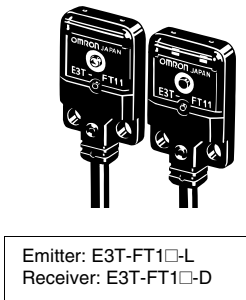
CAD file	E3T_03
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Mounting Holes



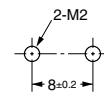
Through-beam Models (Flat Type)

E3T-FT1□ (Emitter, Receiver)



Type	CAD file
Emitter	E3T_07
Receiver	E3T_06

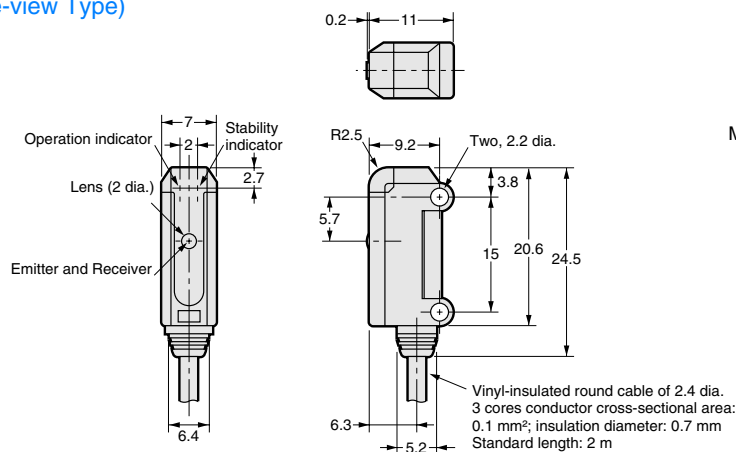
Mounting Holes



Note: For E3T-FT11/FT13 and E3T-FT12/14 Receivers only.

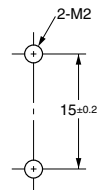
Retroreflective Models (Side-view Type)

E3T-SR1□



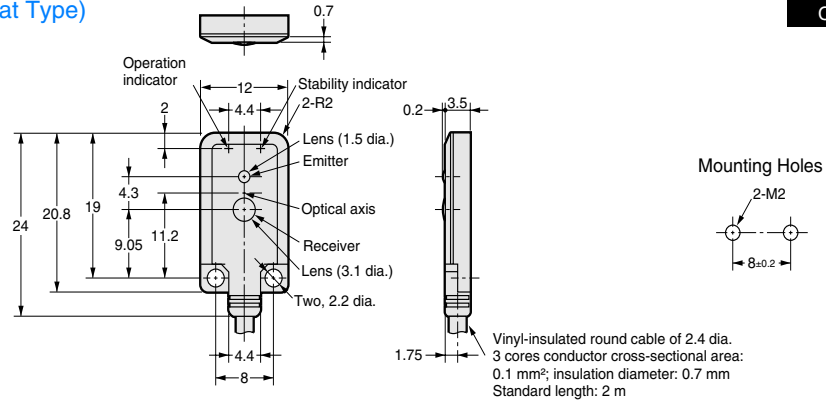
CAD file	E3T_02
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Mounting Holes



Diffuse Reflective Models (Flat Type)
E3T- FD1□

CAD file E3T_05

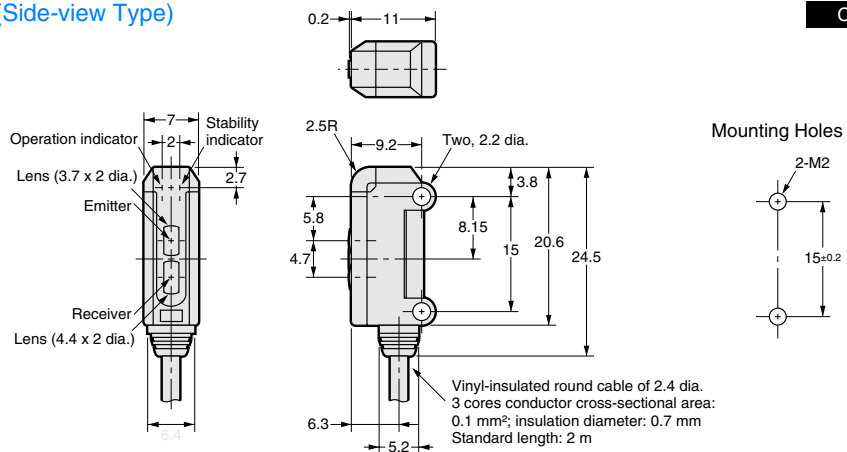


Mounting Holes

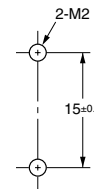


Limited Reflective Models (Side-view Type)
E3T-SL1□
E3T-SL2□

CAD file E3T_01



Mounting Holes

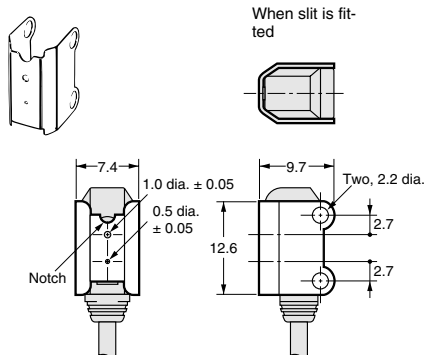


Accessories (Order Separately)

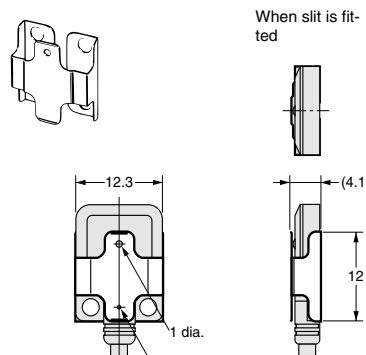
(for Through-beam E3T-FT1□)
With Slit mounted
E39-S63

(for Through-beam E3T-FT1□)
With Slit mounted
E39-S64

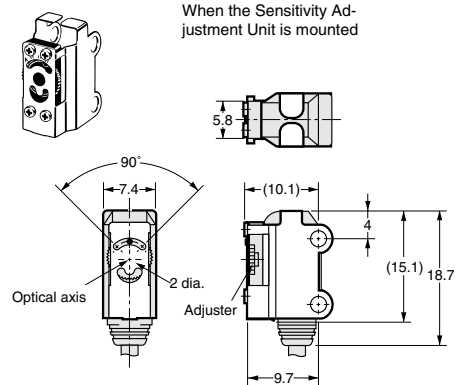
Sensitivity Adjustment Unit (for E3T-ST1□)
E39-E10



Material: Stainless steel (SUS301) 0.2 mm-thick
Note: Align the notch direction of the Slit when installing on the Emitter and Receiver.



Material: Stainless steel (SUS301) 0.1 mm-thick

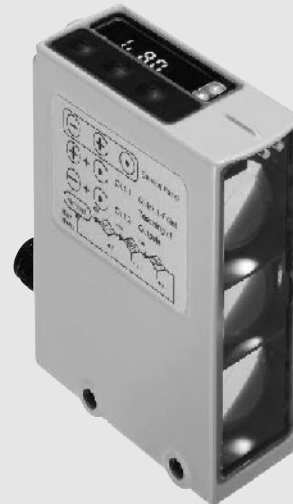


Material: Stainless steel (SUS301)

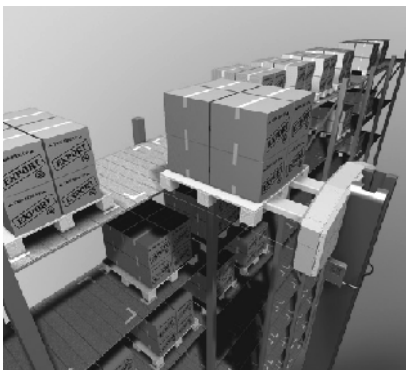
Distance-setting photoelectric Sensor

E3NT-L

“Teach & play” in combination with a user friendly display and a large sensing distance



Application



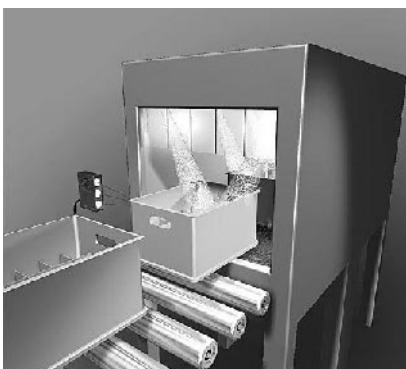
The E3NT-L can check if there is shelf-space free for a pallet.



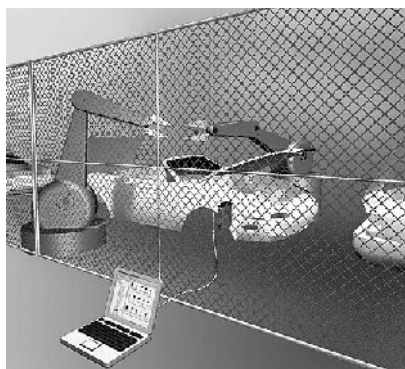
Two outputs can distinguish whether there is one, two or even more pallets in the storage location.



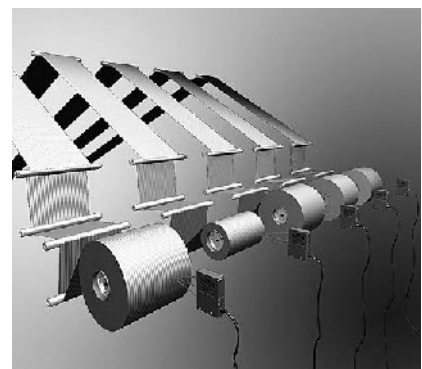
This robust sensor is ideal for operation in the harshest of environments.



Machines in the food industry need to be cleaned frequently. With rapid temperature changes, and lots of water and steam, a completely sealed sensor with window heating is essential.



Thanks to the optic link, the sensor can be remotely set and checked while it is operating in an area where access is restricted.



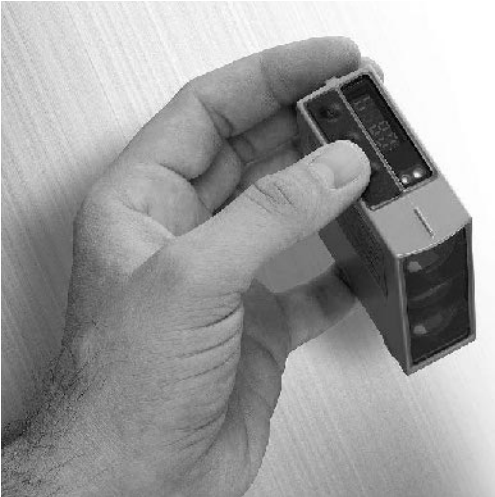
A version of the E3NT-L with a analogue output is available, making it ideal for winding/unwinding applications.

Features

One of the most advanced sensors in the world.

Omron's E3NT-L is a distance-setting photoelectric sensor whose ease-of-use, robustness and intelligence make it one of the most advanced sensors on the market. The E3NT-L has a detection range of up to 2000 mm, and features background and foreground suppression. Its patented optic design enables this innovative sensor to reliably detect objects regardless of their direction.

It is teachable and can be operated via just three keys. It is fully digital for stable, reliable information, and can be adapted to operate in the harshest of environments. These features make the E3NT-L suitable for applications in the material warehousing and food processing industries, where long yet precise distance sensing is required.



Built for every environment

The E3NT-L is a sealed unit. Its robust aluminium housing and smooth body design prevents dirt from easily attaching to it. This makes the E3NT-L ideal for use in the food processing industry. An optional coating enables it to operate in environmentally aggressive conditions, and an anti-condensation option with heated glass window enables it to cope in very low temperature environments.

Patented optic design for reliable sensing

The E3NT-L sensor's optics are specially arranged so that distance is evaluated using the 'double triangulation' principle. This patented optic design enables the E3NT-L to reliably detect objects regardless of their direction. It also enables the rotary position of the E3NT-L to be selected freely about its optical axis, which makes this sensor ideal for multi-axis handling equipment. The E3NT-L's background and foreground suppression features means that objects are detected only within the predefined sensing zone. Objects in the background or foreground of that zone are ignored.

'Teach & play' manually...

Setting up the E3NT-L is fast and easy via external pushbuttons. Its 'teach & play' design concept enables you to teach the sensor the distance of the detectable object simply by pressing one push-button. The built-in 3 pushbutton keypad and a 4-digit display enable you to set and monitor parameters via a user-friendly menu.



Or via computer!

The E3NT-L can also be remotely configured using Omron's PC configuration Sensor Support Software package, whose features include teaching, operation and mode set-up, I/O configuration and distance monitoring via a trend graph. This software not only saves you configuration time, it also makes field exchange, firmware upgrading and remote troubleshooting easy.

Multi-purpose bracket

Omron's specially designed multi-purpose bracket enables the E3NT-L to be installed in a wide variety of positional choices for optimal sensing performance.

Optical link adapter

Omron's E3NT-AL232 optical link adapter clips to fit the E3NT sensor's communication head for connector-less data transfer between the sensor and your PC. This is ideal when the E3NT-L is installed in an area where access is restricted. Via this link and your PC you can continuously monitor the sensor's operation from the comfort of a remote area.

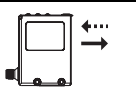
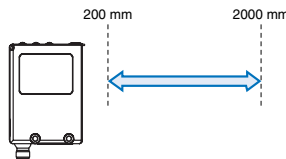
Sensor Support Software (S³)

With Omron's Sensor Support Software (S³) package you can enjoy the benefits of copying multiple customised sensor settings, monitoring for more detailed analysis, setting up parameters much more easily, and tracing.



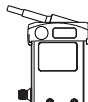
Ordering Information

Sensors



Sensing method	Appearance	Connection method	Setting distance	Model	
				Digital output	Digital and analog output
Distance setting (BGS/FGS)		M12 Connector (5-pole)		E3NT-L17	E3NT-L27
				E3NT-LH17	
E3NT-L37	E3NT-L47				
E3NT-LH37					

Accessories (order separately)



Optical data link

Communication method to sensor	Appearance	Communication method to PC	Model
IR data interface		RS232	E3NT-AL232 2M

Mounting brackets

Appearance	Model	Qty.	Remarks
	E39-EL1	1	Universal mounting bracket
	E39-EL2	1	Adapter bracket (for use of the universal mounting bracket for not matching holes)

Sensor I/O connectors

Size	Cable type	Shape	Cable length	Model	
M12	Standard 5-pole	Straight		2m	XS2F-D521-DG0-A
			5m	XS2F-D521-GG0-A	
		L-shape		2m	XS2F-D522-DG0-A
				5m	XS2F-D522-GG0-A

E3NT-L

Rating/performance

Sensors

Item	Model		
	E3NT-L17 E3NT-L37	E3NT-L27 E3NT-L47	E3NT-LH17 E3NT-LH37
Sensor type	Diffuse reflective sensor with background suppression respectively foreground suppression		
Signal evaluation	Double triangulation method		
Configuration	By push button on the sensor or with a PC connected via the optical data link E3NT-AL232 2m		
Operating modes	Background suppression, foreground suppression, background and foreground suppression (2-point window evaluation)		
Light source	Infrared LED 850 - 880 nm		
Rated sensing distance	2 m		
Setting distance Sr	Distance – setting possible between 0.2 ... 2.0 m (90 % remission) 0.2 ... 1.7 m (6% remission)		
Standard measured object	Kodak gray card 90% (white), size: 200 x 200 mm		
Blind zone	< 0.1 m		
Black/white error (6%/90%)	< 15 % of setting distance Sr		
Hysteresis	< 5 % of setting distance Sr or 4cm (for white 90%) < 10 % of setting distance Sr or 6cm (for black 6%)		
Repetition accuracy	< 5 % (of setting distance Sr) or 4cm		
Light spot diameter	< 40 mm in the case of Sr = 2 m		
Minimum object size	> 40 mm		
Ambient light immunity to EN 60947-5-2:	Halogen lamps (100-120Hz) > 10,000 lux Fluorescent lamps (30 kHz) > 5,000 lux Energy saving lamps > 2,000 lux		
Utilization category to EN 60947-5-2	DC 12		
Rated operating voltage	+ 24 V DC, polarized		
Operating voltage range	+ 10 ... + 30 V DC		
Current consumption	< 90 mA (display off) < 110 mA (display on)	< 100 mA (display off) < 120 mA (display on)	< 220mA with front pane heating
Power-on delay	< 300 ms		
Input – / Output – pins	Pin 2 = Input (In 2) or output (Out 2), depending on configuration Pin 4 = Output (Out 1) Pin 5 = Input (In 1) Pin 5 = Analog output Pin 5 = Input (In 1)		
Digital Outputs	User set functions (e.g. switching output, alarm output, ...)		
Output circuit	User set PNP (open collector), NPN (open collector) or complementary (push-pull)		
Output current	max. 100 mA		
Voltage drop	< 2.0 V		
Residual current	< 100 µA		
Circuit protection	Reversed power supply, overload, short-circuit (pulsed)		
Inputs	User set functions (e.g. teach-in, trigger, test, ...)		
Input circuit	Voltage input +10 V ... U _{supply}		
Input pulse duration	min. 1 ms		
Analog Output		Current output 3..21mA: • 3 mA correspond to distance < 0.2 m • 4 ... 20 mA correspond to distance 0.2 m ... 2.0 m • 21 mA correspond to distance > 2.0 m (or no object)	
Switch-on/off time (T _{ON} / T _{OFF})	≤ 2.5 ms	≤ 5 ms	≤ 2.5 ms
Insulation resistance	20 MΩ at 500 V DC		
Insulation voltage strength	1 kV AC, 50/60 Hz (1 min)		

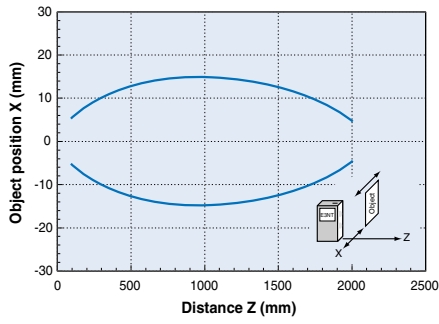
Item	Model		
	E3NT-L17 E3NT-L37	E3NT-L27 E3NT-L47	E3NT-LH17 E3NT-LH37
Impulse strength (insulation)	6 kV		
Dimensions (length x width x depth)	85 x 27 x 65 mm		
Materials			
Housing	Powder-coated aluminum, sea-water resistant, 231 GD AlSi12 (Cu) (standard version) Aluminum with foodstuff-approved coating (option)		
Front pane	Glass		
Keyboard	HTV silicone		
Seals	RTV silicone		
Housing color	Grey, RAL 7030		
Assembly	Screw fastening by way of four M5 threads and two M5 through holes or with universal mounting bracket (order separately)		
Connection	M12 connector, 5-pole (piercing)		
Ambient temperature range	- 25 °C ... + 55 °C	- 10 °C ... + 55 °C (analog output)	- 40 °C ... + 55 °C
Storage temperature range	- 40 °C ... + 60 °C		
Permissible relative humidity	35 % ... 95 %, no condensation		
Enclosure rating	IP 67 (EN 60529/IEC 529)		
Protection class	II (250 V AC)		
Vibration resistance (to IEC 68-2-6)	± 1.5 mm, 1 h, 10 - 70 Hz		
Shock resistance (to IEC 68-2-27)	300 m/s ²		
User set parameters	<ul style="list-style-type: none"> - Mode - Output function - Teach/set switching points - Output switching - Function on connector pin 2 and 5 - Switch-on and off delay - Type of switch-off time function - Type of display on the sensor - Keyboard lock - Energy saving mode - Display direction - Reset to factory defaults 		

Accessories

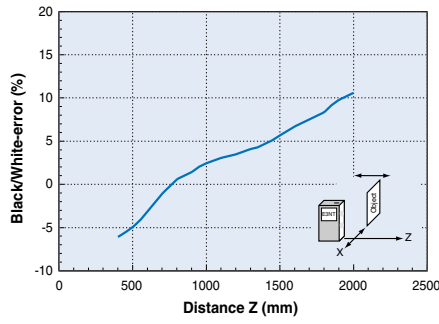
Item	Model
	E3NT-AL 232 2 M
Dimensions (length x width x depth)	29.5 x 72.9 x 26.4 mm
Housing material	ABS and PMMA (IR transparent)
Housing colour	Black, RAL 9005
Assembly	Snap mounting on sensor
Connection	2 m connecting cable with 9-pole sub-D connector
Ambient temperature range	- 10 °C ... + 50 °C
Storage temperature range	- 40 °C ... + 60 °C
Permission relative humidity	35% ... 85%, no condensation
Degree of protection to EN 60529 / IEC 529	IP 54
Emitted light	IR communication element 880 nm
Rated operating voltage	Via RS 232 interface from PC
Current consumption	6 mA

Characteristic data (typical)

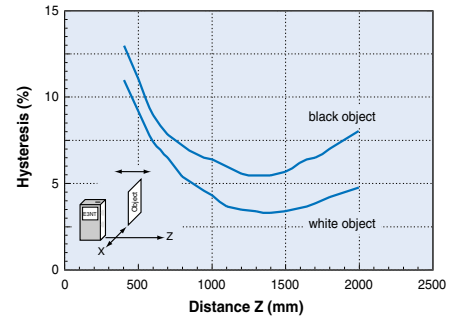
Operating range
(90% remission)



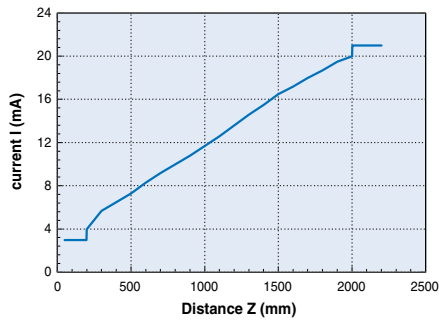
Black/White - Error
(6% - 90% remission)



Hysteresis

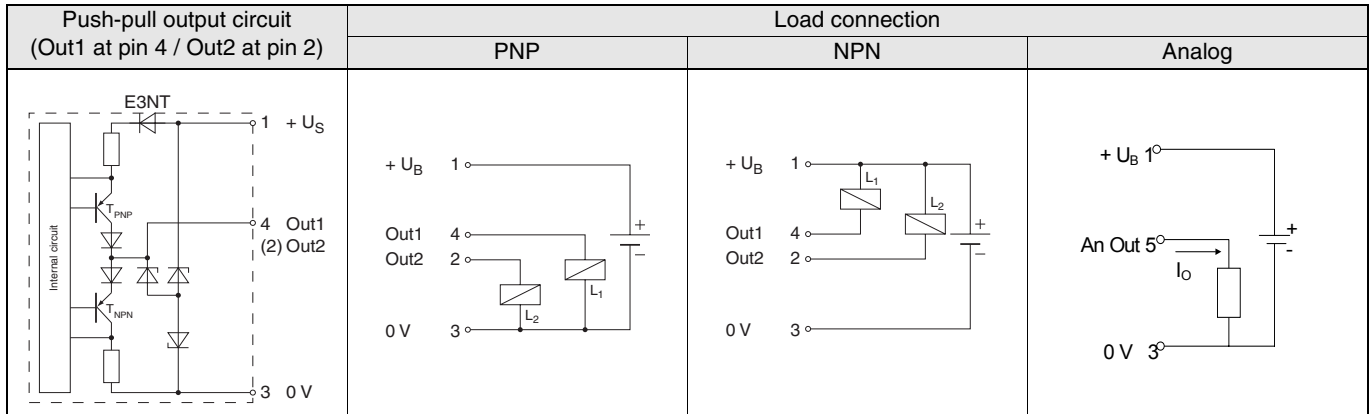


Analog output current
(90% remission)



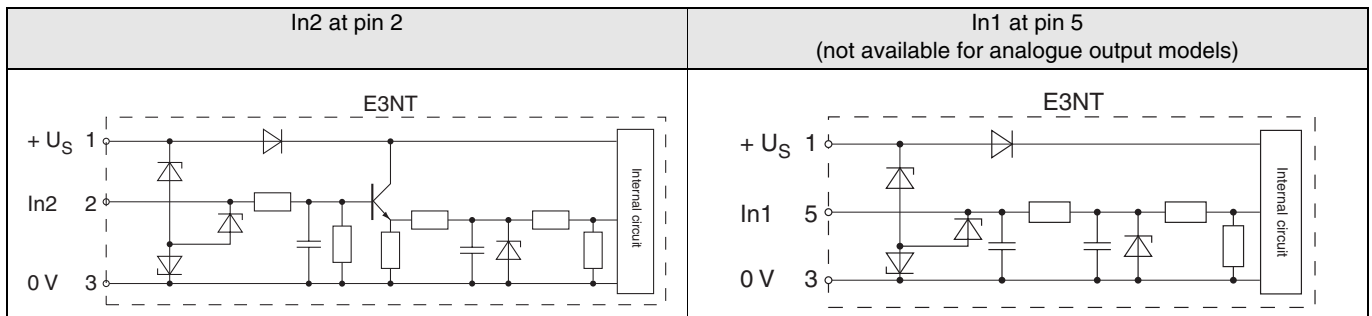
Circuit diagram

Output



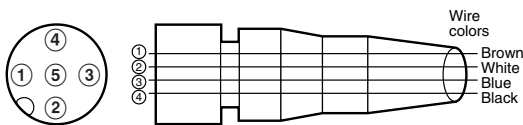
When use is made of the PNP or NPN output circuit, the output circuit that is not selected is deactivated. When used as a complementary output, NPN or PNP outputs act in antiphase as the switch state changes.

Input



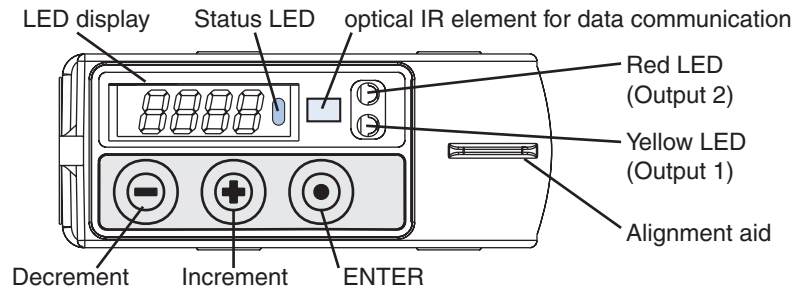
The sensor inputs are realised in positive logic and detect a positive voltage level of more than 1 ms duration as a valid signal if the voltage level is between 10 V and the power supply voltage.

Connectors



Class	Wire jacket color	Connector pin no.	Application
For DC	Brown	1	Power supply (+V)
	White	2	Output or Input Out2 / In2
	Blue	3	Power supply (0V)
	Black	4	Output Out1
	Grey	5	Analog Output or Input In1

Nomenclature



LED display	The distance from the measured object and the names of the menu levels during set-up of the sensor are displayed by the 4-digit 7-segment LED display. The display appears as red digits or letters. If the sensor is set to a bar chart display, the distance from the measured object is displayed as a green LED bar chart.		
LED	The switching status and the stability of the two outputs are signalled as follows by two LEDs, visible from the top and the front of the sensor:		
	Yellow LED (Output 1)	ON	Object stably detected
		Blinking	Object not stable detected
		OFF	No object within range
	Red LED (Output 2)	ON	Object stably detected
		Blinking	Object not stable detected
OFF		No object within range	
Status LED	ON	Set-up menu selected	
	Blinking	Menu level with change of setting distance	
	OFF	RUN (normal) mode	

Operation

Setting the switching points

The switching points can either be user set (Teach-in mode) with a measured object positioned at the corresponding distance or can be set using the setting input, for remote setting. For each output of the sensor (up to two), up to two switching points can be user set.

Only one switching point is active in the foreground and background suppression modes.

For the 2-point window evaluation mode, two switching points must be set.

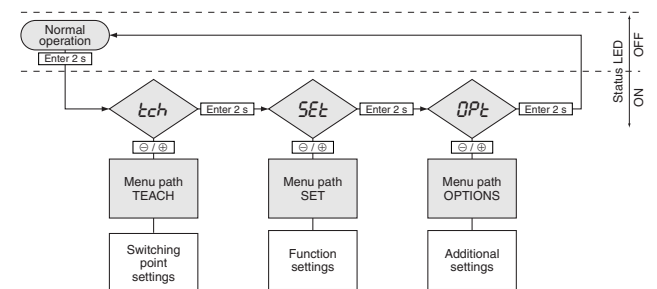
Teaching the switching points in the normal mode

The sensor is set at the factory for both outputs to **BGS**, light on.

- Place the target object in front of the sensor at the desired position.
- Teach the switching point for output 1:
 - Beginning with the ⊕ key, press it simultaneously with the ENTER ⊙ key. Threshold level is obtained and the output/LED is updated. Status LED is blinking.
 - Using the ⊕/⊖ keys an adjustment of the switching point is possible. The output/LED is updated immediately.
 - Pressing the ENTER ⊙ key for more than 2 seconds or after 2 minutes without any activation of the keys, the sensor returns to normal operation. The status LED is turned off.
- Teach the switching point for Output 2:

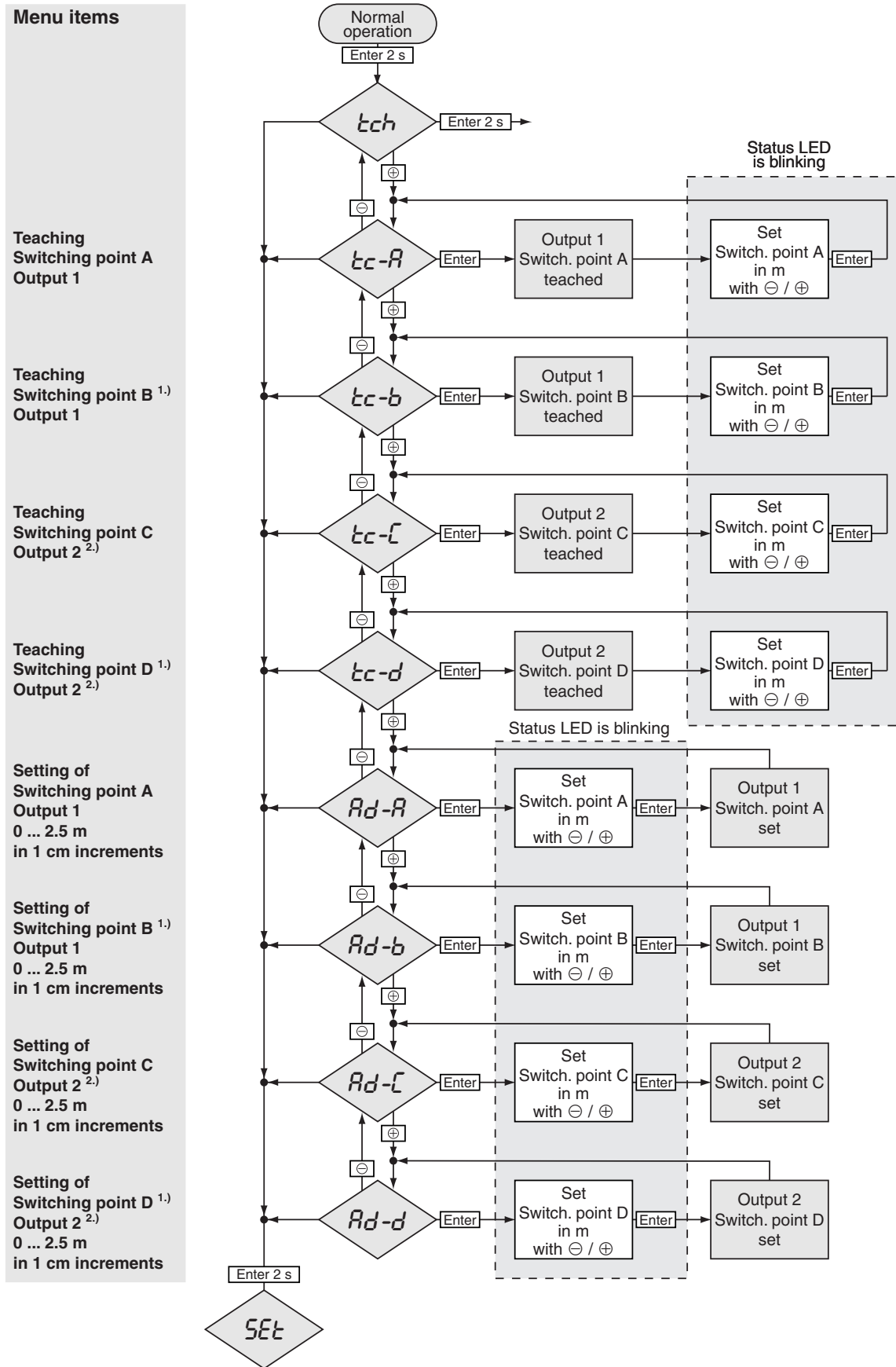
- Beginning with the ⊖ key, press it simultaneously with the ENTER ⊙ key.

Main menu structure



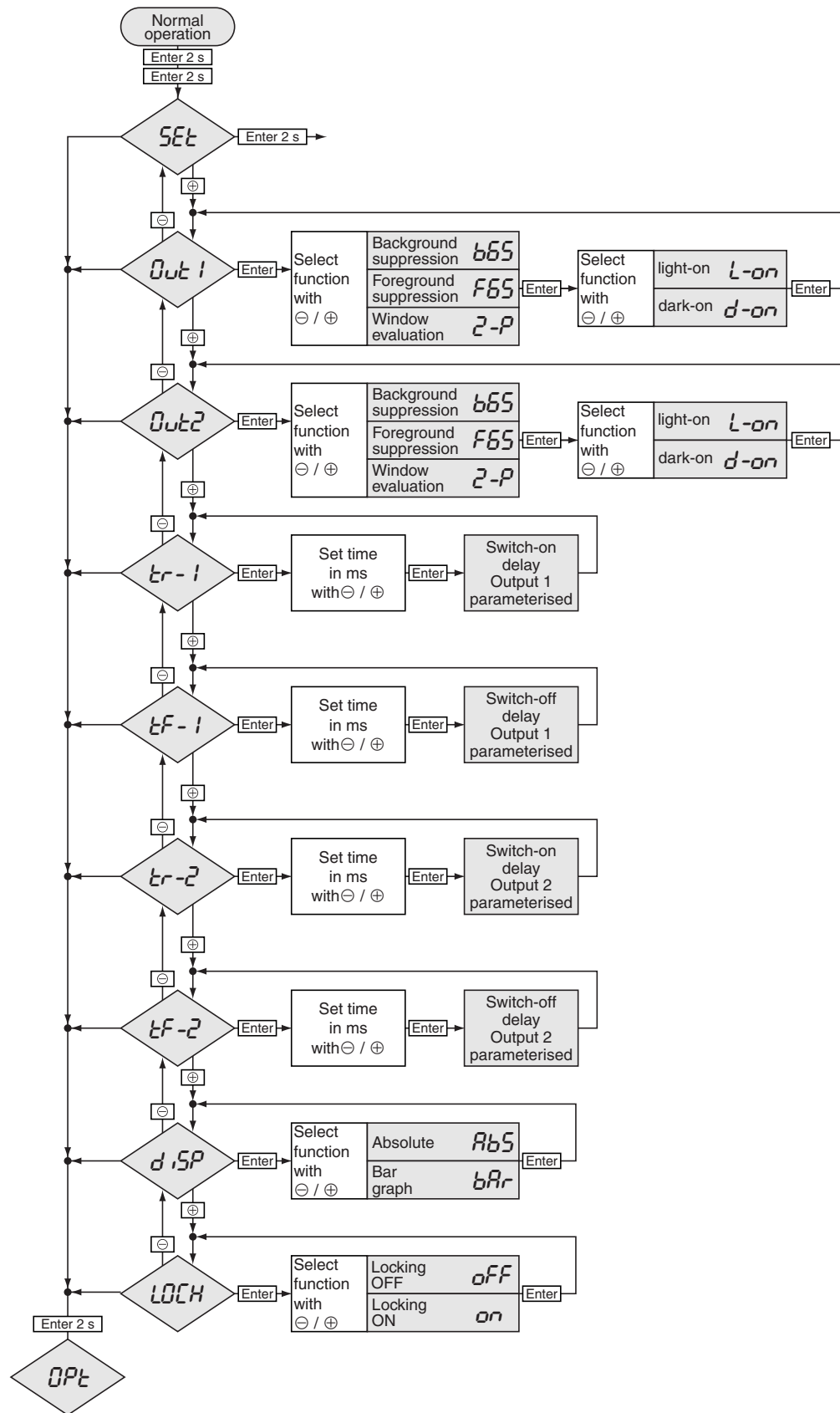
When the ENTER ⊙ key is pressed for 2 seconds, the sensor switches from the normal mode to the TEACH menu path. The sensor switches to each next menu path when the ENTER ⊙ key is repeatedly pressed for 2 seconds. In the menu paths, the required parameters can be selected by pressing ⊖ and ⊕ keys.

- To skip a menu path, you can also press the ENTER key for 4 seconds.
- [ENTER] Press the ENTER ⊙ key < 1 second
- [ENTER 2s] Press the ENTER ⊙ key > 2 seconds.

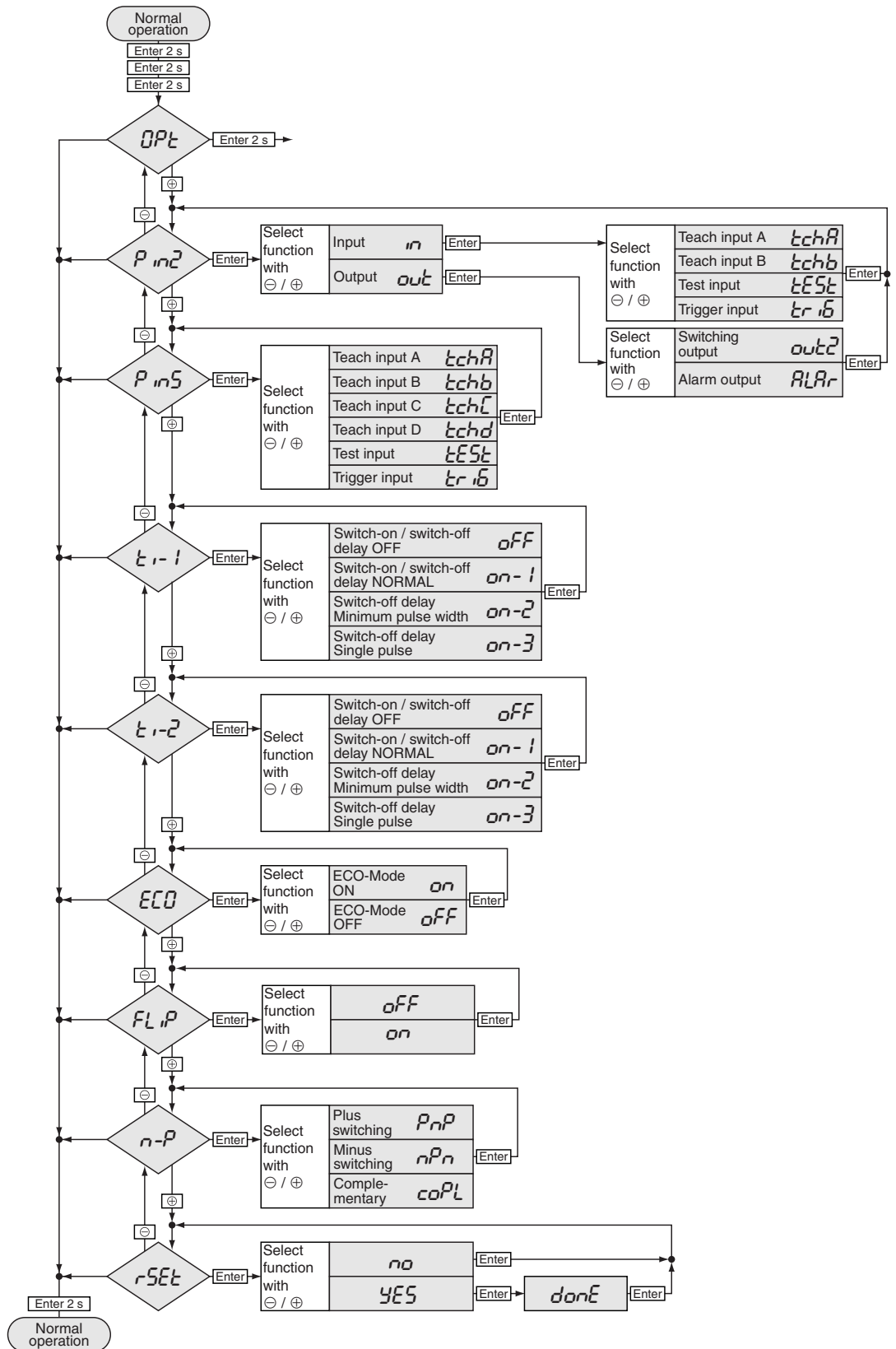


SET menu

- Menu items**
- Function Output 1
 - Function Output 2 ^{1.)}
 - Switch-on delay ^{2.) 5.)} Output 1
0 ... 9999 ms
in 1 ms decrements
 - Switch-off delay ^{2.) 3.)} Output 1
0 ... 9999 ms
in 1 ms decrements
 - Switch-on delay ^{2.) 5.)} Output 2 ^{1.)}
0 ... 9999 ms
in 1 ms decrements
 - Switch-off delay ^{2.) 3.)} Output 2 ^{1.)}
0 ... 9999 ms
in 1 ms decrements
 - Distance display
 - Key lock ^{4.)}



- Menu items
- Function Connector pin 2
- Function Connector pin 5
- Function Switch-on / switch-off delay Output 1
- Function Switch-on / switch-off delay Output 2 ¹⁾
- Energy saving mode ECO ²⁾
- Turn display
- Output stage
- Reset to Works default

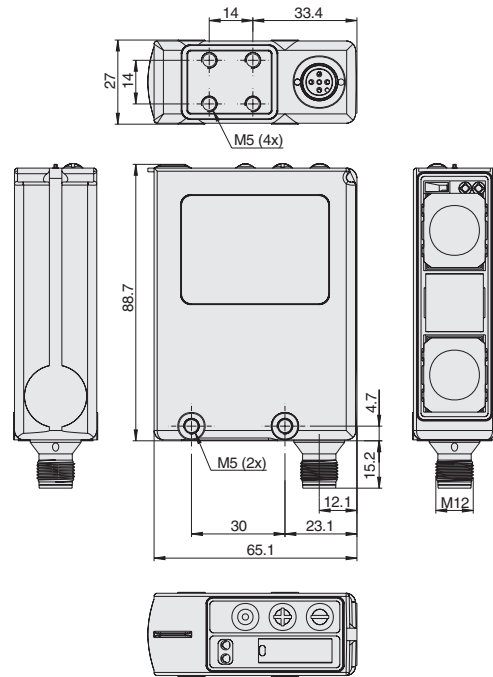
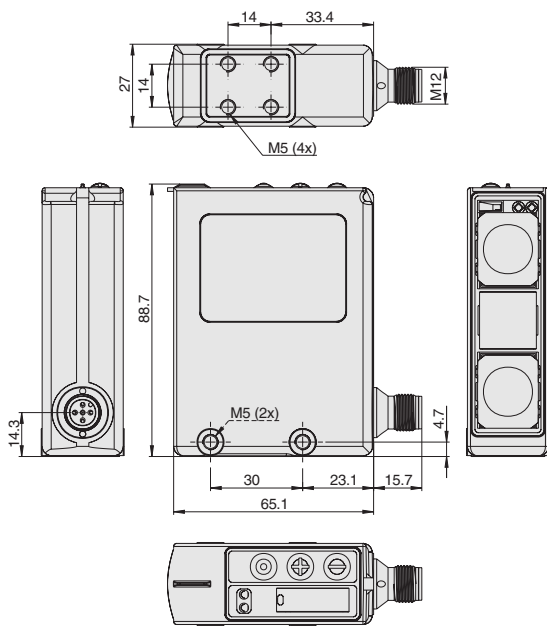


Dimensions

Sensors

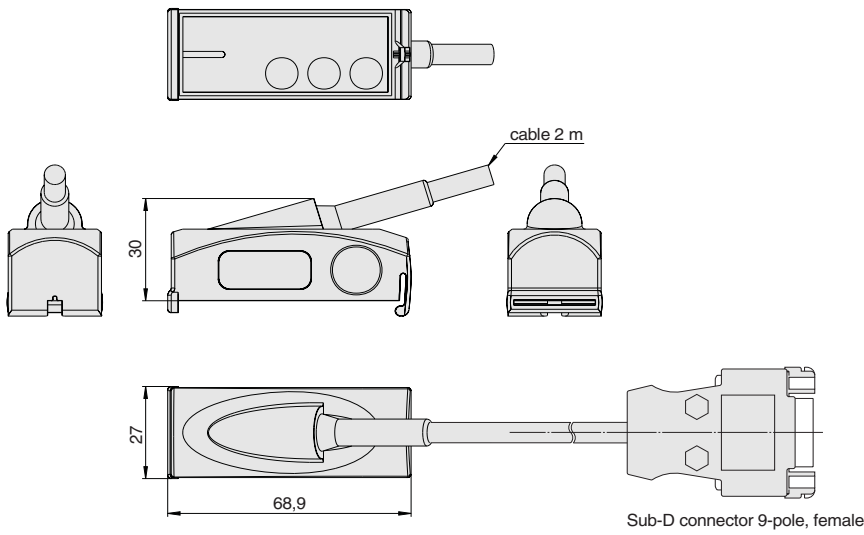
E3NT-L17
E3NT-L27
E3NT-LH17

E3NT-L37
E3NT-L47
E3NT-LH37



Accessoires (order separately)

Optical data link
E3NT-AL232 2m



Precautions

⚠ Caution

Do not connect an AC power supply to the Sensor. If AC power (100 VAC or more) is supplied to the Sensor, it may explode or burn.

Be sure to abide by the following precautions for the safe operation of the Sensor.

Safety notes

The diffuse reflective sensors in the E3NT type series may only be used as described in these operating instructions.

They may only be operated as part of a higher-level overall system, e.g. of a machine installation.

Diffuse reflective sensors in the E3NT type series must not be used as safety components within the scope of the EU machine guideline.

Their use is not permitted in applications in which the safety of persons depends on functioning of the sensor!

Wiring

Power Supply Voltage and Output Load Power Supply Voltage

Make sure that the power supply to the Sensor is within the rated voltage range. If a voltage exceeding the rated voltage range is supplied to the Sensor, it may explode or burn.

Load Short-circuiting

Do not short-circuit the load, otherwise the Sensor may be damaged.

Operating Environment

Do not use the Sensor in locations with explosive or flammable gas.

Correct Use

Design

Power Reset Time

The Sensor is ready to operate 300 ms after the Sensor is turned ON. If the load and Sensor are connected to independent power supplies respectively, be sure to turn ON the Sensor before supplying power to the load.

Wiring

Avoiding Malfunctions

If using the Photoelectric Sensor with an inverter or servomotor, always ground the FG (frame ground) and G (ground) terminals, otherwise the Sensor may malfunction.

Mounting

Mounting the Sensor

- If Sensors are mounted face-to-face, make sure that the optical axes are not in opposition to each other. Otherwise, mutual interference may result.
- Always install the Sensor carefully so that the aperture angle range of the Sensor will not cause it to 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 lose its water-resistive properties.
- Use M5 screws to mount the Sensor.
- When mounting the case, make sure that the tightening torque applied to each screw does not exceed 0.54 Nm.

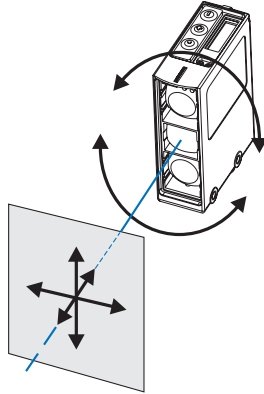
M12 Connector

- Always turn OFF the power supply to the Sensor before connecting or disconnecting the connector.
- Hold the connector cover to connect or disconnect it.
- Secure the connector cover by hand. Do not use pliers, otherwise the connector may be damaged.
- If the connector is not connected securely, it may be disconnected by vibration or the proper degree of protection of the Sensor may not be maintained.

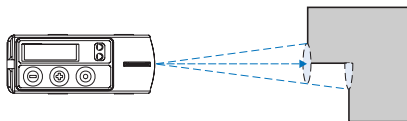
Mounting Directions

Sensor assembly

Contrary to sensors with single triangulation, E3NT with double triangulation, allows the measured object's direction of motion to be in all three directions. Thus, the rotatory position of the sensor about its optical axis can be chosen freely.



If the light spot is not completely on the same plane as the target object (minimum object size) the distance is not determined and malfunction can occur. If necessary a trigger signal or timer function has to be applied.

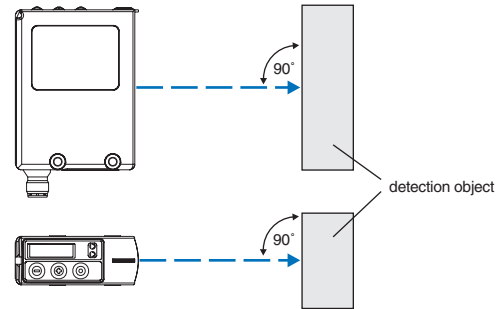


The sensor must be fitted so that:

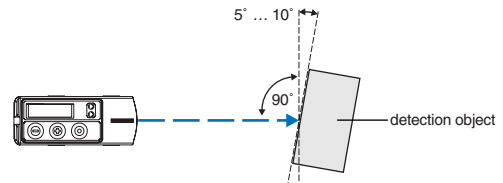
- It is correctly aligned before it is adjusted
- It is protected as far as possible against vibration and shock
- It is protected as far as possible against extraneous incident light
- It is protected as far as possible against damage and soiling
- Electrical connection is possible
- It is as accessible as far as possible for maintenance work
- Operation of the push buttons is possible
- The display is visible.

Sensor's assembly direction

As far as possible, the sensor's optical surface should be aligned parallel to the surface of the measured object.



If the measured object has a glossy, reflecting surface, the sensor's optical system should be tilted by 5 ... 10° in relation to the surface of the measured object.



If there is a reflecting surface in parallel with the sensor's optical axis, this might lead to unstable switching states.

Therefore, reflecting objects within the sensor's optical axis should be avoided.

If this should not be possible, the reflecting surface should not be parallel to the sensor's optical axis, but should be rotated by at least 10°.

Mirror-like objects can cause malfunction inside and outside the sensing range. Avoid mirror-like objects in or close to the optical axis.

Inspection and Maintenance

Cleaning

Do not use any scratching or abrasive cleaning materials. The protective pane of the optical system might get damaged.

The sensor requires no maintenance.

Remove dirt build up from the optical system and the display at regular intervals only with a soft, non abrasive fabric. Residual dirt may have influence on the switching point and display accuracy.

Oil-resistive, long-distance photoelectric sensor (metal case)

E3S-C

Achieves excellent water/oil-resistance and long-distance detection.



Features

Meets IP67 tough standard water/oil resistance

E3S-C meets the IP67 requirements of the IEC standards and 6P of the NEMA standards. E3S-C can be used worry-free in automotive assembly lines and other production lines where oil vapor exists. It can also be applied to food processing lines because it resists hydrogen peroxide, detergent and potassium hydroxide.

Sensing distance is six times longer than that of conventional OMRON photoelectric sensor

The sensing distance of the E3S-C is six times longer than that of the conventional, metal case type OMRON photoelectric sensor. The through-beam, retroreflective (with M.S.R. function) and diffuse reflective models have sensing distances of 30, 3 and 2 meters, respectively.

Through-beam Model	5m E3S-5E4	30m
Retroreflective Model	2 m (non-polarized) E3S-R2E4	3 m (polarized)
Diffuse Reflective Model	300mm E3S-DS30E4	2m

Excellent shock resistance of 1,000 m/s²

The industry's top-class photoelectric sensor features shock resistance of 1,000 m/s², which is as high as that of a proximity sensor at rated values, and vibration resistance of as high as 10 to 2,000 Hz. The E3S-C can be used worry-free in metal processing, conveyor and other lines.

Lineup of M12 metal connector joint type models

Lineup of water/oil/shock-resistant M12 metal connector joint type models are available. This series ensures ease of sensor replacement during maintenance.

NPN/PNP output selector

The operation panel has the NPN/PNP output selector. You need not prepare two NPN and PNP models for export. You need not worry about malfunctions due to noise, either.



Mutual interference prevention enhanced (Retroreflective, diffuse reflective models)

Fuzzy inference is introduced into the mutual interference prevention for the first time in the industry. This prevents a malfunction due to mutual interference, enabling two sensors to be mounted closely side by side.

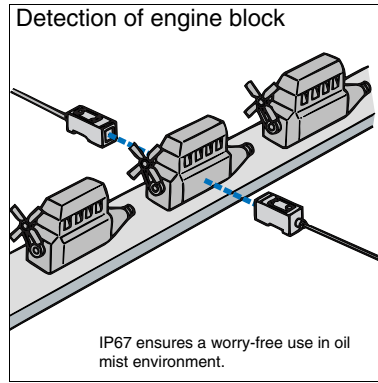
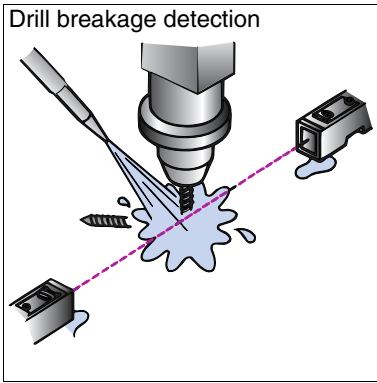
Easy optical axis alignment

OMRON's original "automatic position compensation system" minimizes misalignment of mechanical and optical axes to merely ±2°. The optical axis is aligned perfectly by only installing the sensor.

PAT Pending

First in the Industry

Application



Ordering Information

Sensors

Red light Infrared light

Sensor type	Shape	Connection method	Sensing distance	Model
Through-beam	Horizontal Model 	Pre-wired		E3S-CT11
		Junction connector		E3S-CT11-M1J
	Vertical Model 	Pre-wired		E3S-CT61
		Junction connector		E3S-CT61-M1J
Retroreflective Models	Horizontal Model 	Pre-wired		E3S-CR11
		Junction connector		E3S-CR11-M1J
	Vertical Model 	Pre-wired		E3S-CR61
		Junction connector		E3S-CR61-M1J
Diffuse-reflective	Horizontal Model 	Pre-wired		E3S-CD11
				E3S-CD12
		Junction connector		E3S-CD11-M1J
				E3S-CD12-M1J
	Vertical Model 	Pre-wired		E3S-CD61
				E3S-CD62
		Junction connector		E3S-CD61-M1J
				E3S-CD62-M1J

Accessories (Order Separately)

Slits

Slit width	Sensing distance	Minimum sensing object (typical)	Model	Quantity	Remarks
Width 0.5 mmx11 mm	1.8 m	0.5 mm dia.	E39-S61	1 each for emitter and receiver (total of 8 pcs.)	(Plug-in type long slit) Can be used with through-beam E3S-CT□1 (-M1J).
Width 1 mmx11 mm	3.5 m	1 mm dia.			
Width 2 mmx11 mm	7 m	2 mm dia.			
Width 4 mmx11 mm	15 m	2.6 mm dia.			

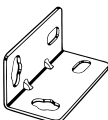
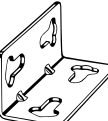
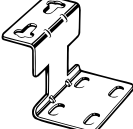
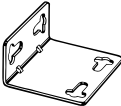

Reflectors

Name	Sensing distance (typical)	Model	Quantity	Remarks
Reflectors	3 m (rated value)	E39-R1	1	Attached to the Retroreflective E3S-CR□1 (-M1J).
	4 m	E39-R2	1	---
Small reflector	1.5 m	E39-R3	1	---
	750 mm	E39-R4	1	---
Tape Reflector	700 mm (50 mm) *	E39-RS1	1 pc.	The M.S.R. function is available.
	1,100 mm (100 mm) *	E39-RS2	1 pc.	
	1,400 mm (100 mm) *	E39-RS3	1 pc.	

* Values in parentheses indicate the minimum required distance between the sensor and reflector.



Note: 1. When the reflector used is other than the supplied one, set the sensing distance to about 0.7 times of the typical example as a guideline.

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L102	1	Attached to the horizontal model.
	E39-L103	1	Attached to the vertical model.
	E39-L85	1	Mounting bracket designed to switch from E3S-□□□□42, 44 to the vertical model of E3S-C.
	E39-L86	1	Mounting bracket designed to switch from E3S-□□□□43 to the vertical model of E3S-C.
	E39-L87	1	---

Note: If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.

Sensor I/O Connectors

Cable	Shape	Cable length		Model
Standard cable	Straight 	2 m	3-wire type	XS2F-D421-DC0-A
		5 m		XS2F-D421-GC0-A
	L-shaped 	2 m		XS2F-D422-DC0-A
		5 m		XS2F-D422-GC0-A

Rating/performance

Sensor type		Through-beam	Retroreflective model (with M.S.R. function)	Diffuse-reflective	
Item	Model	Horizontal E3S-CT11 (-M1J) Vertical E3S-CT61 (-M1J)	Horizontal E3S-CR11 (-M1J) Vertical E3S-CR61 (-M1J)	Horizontal E3S-CD11 (-M1J) Vertical E3S-CD61 (-M1J)	Horizontal E3S-CD12 (-M1J) Vertical E3S-CD62 (-M1J)
	Sensing distance	30 m	3 m (When using the E39-R1)	700 mm (White paper 300 x 300 mm)	2 m (White paper 300 x 300 mm)
Standard sensing object	Opaque, 15dia. min.	Opaque: 75 mm dia. min.	---		
Differential distance	---		20% max. of sensing distance		
Directional angle	Both emitter and receiver: 3° to 15°	3° to 10°	---		
Light source (wave length)	Infrared LED (880 nm)	Red LED (700 nm)	Infrared LED (880 nm)		
Supply voltage	10 to 30 VDC [ripple (p-p) 10% included]				
Current consumption	Both emitter and receiver: 25 mA max.	40 mA max.			
Control output	Load 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 type (NPN/PNP switch selectable) Light-ON/Dark-ON switch selectable				
Protective circuits	Reverse polarity protection, output short-circuit protection	Reverse polarity protection, output short-circuit protection, mutual interference prevention			
Response time	Operation or reset: 1 ms max.			Operation/reset: 2 ms max. each	
Sensitivity adjustment	Single-turn adjustment		2-turn endless adjuster (with indicator)		
Ambient illuminance	(on Receiver lens) Incandescent lamp: 5,000 lux max. Sunlight: 10,000 lux max.				
Ambient temperature	Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)				
Ambient humidity	Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)				
Insulation resistance	20 M Ω min. at 500 VDC				
Dielectric strength	1,000 VAC at 50/60 Hz 1 minute				
Vibration resistance	10 to 2,000 Hz double amplitude 1.5 mm or 300 m/s ² for 0.5 h in each of X, Y, Z directions				
Shock resistance	1000 m/s ² (approx. -100G) 3 times each in X, Y, and Z directions				
Protective structure	IEC Standard IP67, NEMA 6P (limited to indoors use) *				
Connection method	Pre-wired (standard length: 2 m), Junction connector (standard length: 300 mm)				
Weight (Packed state)	About 270 g (pre-wired type) About 230 g (M12 connector joint type)	About 160 g (pre-wired type) About 130 g (M12 connector joint type)	About 150 g (pre-wired type) About 110 g (M12 connector joint type)		
Material	Case	Zinc diecast			
	Operation panel cover	Polyethyl sulfon			
	Lens	Acrylics			
	Mounting Brackets	Stainless steel (SUS304)			
Accessories	Mounting bracket (with screws), adjusting screwdriver, instruction manual, reflector (Retroreflective model only)				

* NEMA (National Electrical Manufacturers Association) Standards

Output Circuit Diagram

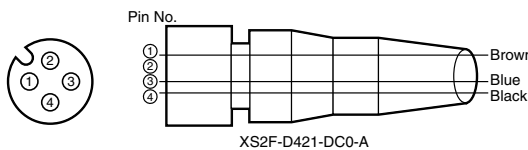
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CT11(-M1J) E3S-CT61(-M1J) E3S-CR11(-M1J) E3S-CR61(-M1J) E3S-CD11(-M1J) E3S-CD12(-M1J) E3S-CD61(-M1J) E3S-CD62(-M1J)	Light ON		L•ON (LIGHT ON)	<p>Receiver (Through-beam Models) Retroreflective, Diffuse Reflective, and Limited Reflective Models</p> <p>* Note: Set the NPN and PNP output selector to NPN.</p> <p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>
	Dark ON		D•ON (DARK ON)	<p>Emitter (Through-beam Models)</p> <p>Connector Pin Arrangement</p> <p>Note: Terminal 2 and 4 are not used.</p>

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CT11(-M1J) E3S-CT61(-M1J) E3S-CR11(-M1J) E3S-CR61(-M1J) E3S-CD11(-M1J) E3S-CD12(-M1J) E3S-CD61(-M1J) E3S-CD62(-M1J)	Light ON		L•ON (LIGHT ON)	<p>Receiver (Through-beam Models) Retroreflective, Diffuse Reflective, and Limited Reflective Models</p> <p>* Note: Set the NPN and PNP output selector to PNP.</p> <p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>
	Dark ON		D•ON (DARK ON)	<p>Emitter (Through-beam Models)</p> <p>Connector Pin Arrangement</p> <p>Note: Terminal 2 and 4 are not used.</p>

Connectors (Sensor I/O connectors)



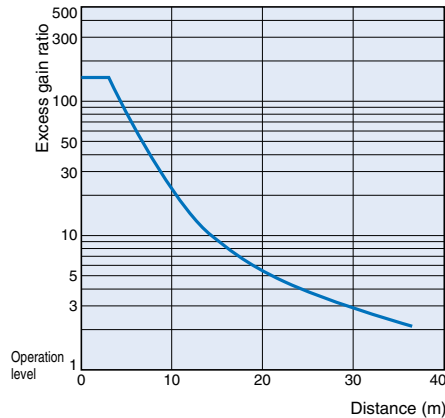
Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	+V
	---	②	---
	Blue	③	0V
	Black	④	Output

Note: Pin 2 is open.

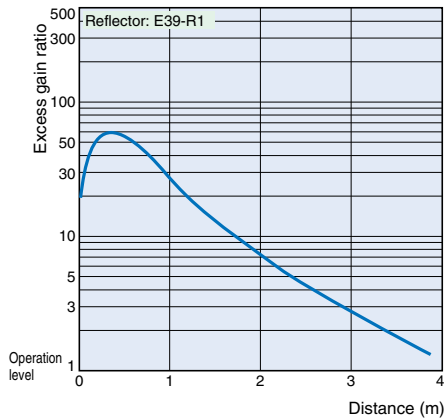
Characteristic data (typical)

Operating Range

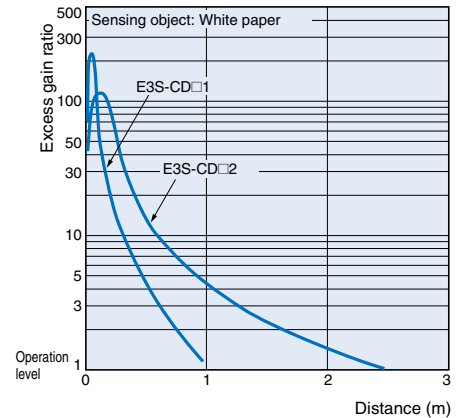
Through-beam
E3S-CT□□(-M1J)



Retroreflective Models
E3S-CR□□(-M1J) + E39-R1 (supplied reflector)

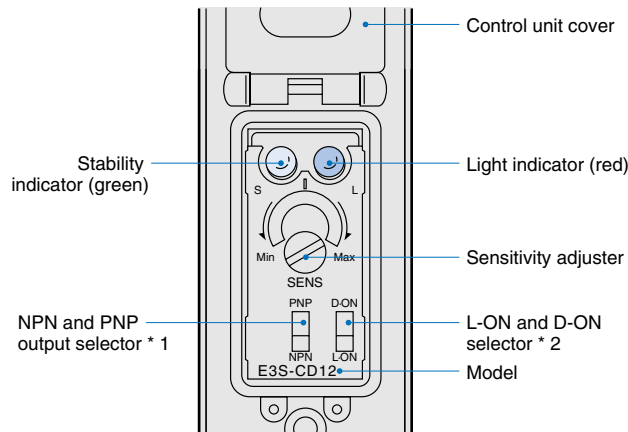


Diffuse-reflective
E3S-CD□□(-M1J)

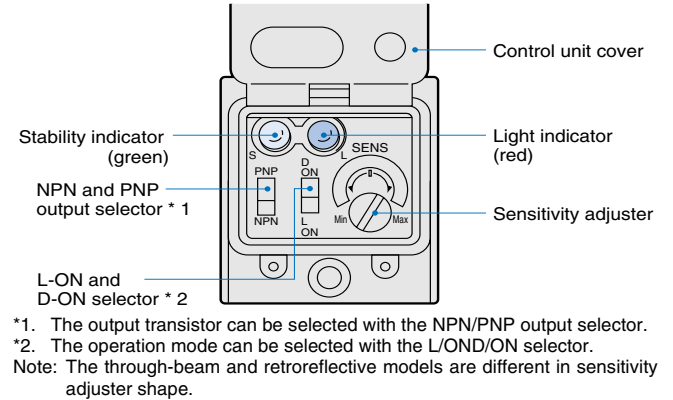


Nomenclature:

(Horizontal type)



(Vertical type)



Operation

Sensitivity adjustment (diffuse reflective model, light-ON)

Sequence	Detection state	Sensitivity adjuster	Indicator state	Adjustment procedure
① Point A	Photoelectric Sensor Sensing object		ON→OFF OFF→ON Stability indicator (green) Light indicator (red)	Place a sensing object in the predetermined position, turn the sensitivity adjuster clockwise (increase sensitivity) until the incident indicator (red) is turned ON, and define this position as (A).
② Point B	Photoelectric Sensor Sensing object Background		ON→OFF ON→OFF Stability indicator (green) Light indicator (red)	Remove the sensing object, turn the sensitivity adjuster further clockwise until the incident indicator (red) is turned ON by a background object, and define this position as (B). Turn the sensitivity adjuster counterclockwise (decrease sensitivity) from (B) until the incident indicator (red) is turned OFF, and define this position as (C). When there is no background object, define the maximum adjuster position (Max) as (C).
③ Setting	---		ON ON↔OFF Stability indicator (green) Light indicator (red)	Set the adjuster in the middle of positions (A) and (C) (optimum sensitivity setting). Also make sure that the stability indicator (green) is turned ON when there is an object and when there is no object. When the indicator is not turned ON, recheck the detection method since there is a little allowance.

Unlike the conventional models, the E3S-C scarcely has sensitivity variations between products. Therefore, you need to make the above adjustment on only one diffuse reflective model of E3S-CD that will be used for detection under the same conditions, and match the indicator points of the other diffuse reflective models of E3S-CD with the above adjusted one. (You need not match the sensitivity of each sensor.)

Precautions

Correct Use

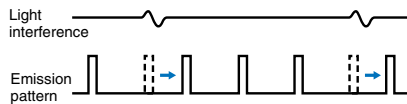
Design

Fuzzy mutual interference prevention

When reflective photoelectric sensors are installed side by side, one sensor may receive the light from the other sensor, which may disturb the incident signal, causing a malfunction. The fuzzy mutual interference prevention monitors interfering light for a predetermined period of time before light is emitted, and imports the interfering light level and incident frequencies as data. Using these values, fuzzy inference is made to find the risk of malfunction to control the light emitting timing, reducing the risk.

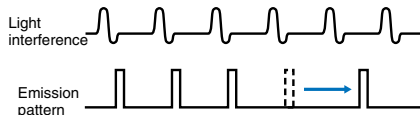
(When risk is low)

Light is emitted after interfering light is gone.



(When risk is high)

Light is emitted after shifting to a gap of interfering light.



Wiring Considerations

Cable

- An oil-resistance cable is used to ensure oil resistance.
- The bending radius should be 25 mm or more.

Installation

Sensor installation

- Note that during the E35-C installation, hammering it will damage the water resistance function.
- Use an M4 screw, tightened to a torque of no more than 1.18 Nm.

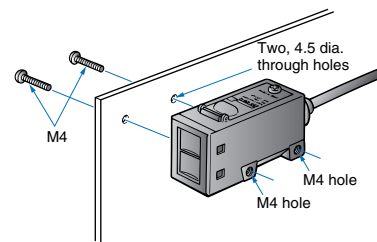
(When using the mounting bracket)

- To set the sensor on the mechanical axis, use the optical axis locking holes.
- When the sensor cannot be set on the mechanical axis, move the E3S-C vertically and/or horizontally and set it in the center of the area where the incident indicator is turned ON. Make sure that the stability indicator is ON.

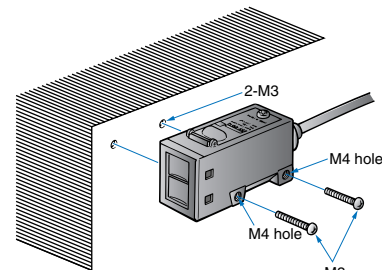
(Direct installation)

Install the E3S-C as shown below.

[M4 screwing]



[M3 screwing]

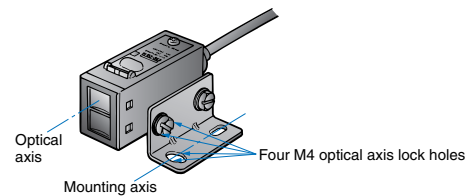


Optical axis adjustment

(Optical axis locking holes)

By fitting screws into the optical axis locking holes, the mounting bracket is set onto the mounting shaft of the mounting bracket.

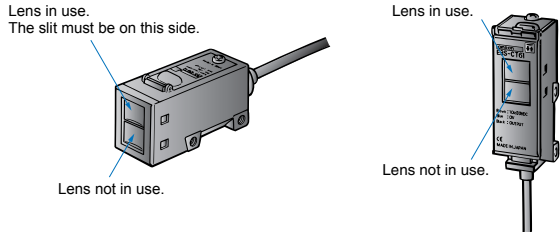
For adjustment



Optical axis position of through-beam model

Unlike the conventional product, the through-beam model has two lenses, but the one actually used is as shown below. When fitting the slit, use it after matching the slit hole with the used lens.

(Horizontal model) (Vertical model)



Water Resistance

To ensure water resistance, tighten the operation panel cover screws to 0.34 Nm to 0.54 Nm torque.

Miscellaneous

Oil resistance/chemical resistance

- Though E3S-C has a high oil resistance, it may not be able to exhibit its performance depending on the oil type. Use oil in compliance with the following table.
- Regarding the oil resistance of E3S-C, it has passed tests on the oils given in the following table. Refer to the table for examining the oil to be used.

Testing oil classification	JIS classification	Product name	Dynamic viscosity (mm ² /s) at 40°C	PH
Lubricant	---	Velocity No. 3	2.02	---
Water-insoluble coolant	Class 2 No. 5	Daphne Cut	Not less than 10 to less than 50	
	Class 2 No. 11	Yushiron Oil No. 2ac	Less than 10	
Water-soluble coolant	Class W1 No. 1	Yushiroken EC50T-3	---	7 to 9.5
		Yushiron Lubic HWC68		7 to 9.9
	Class W1 No. 2	Gryton 1700D		7 to 9.2
	Class W2 No. 1	Yushiroken S50N		7 to 9.8

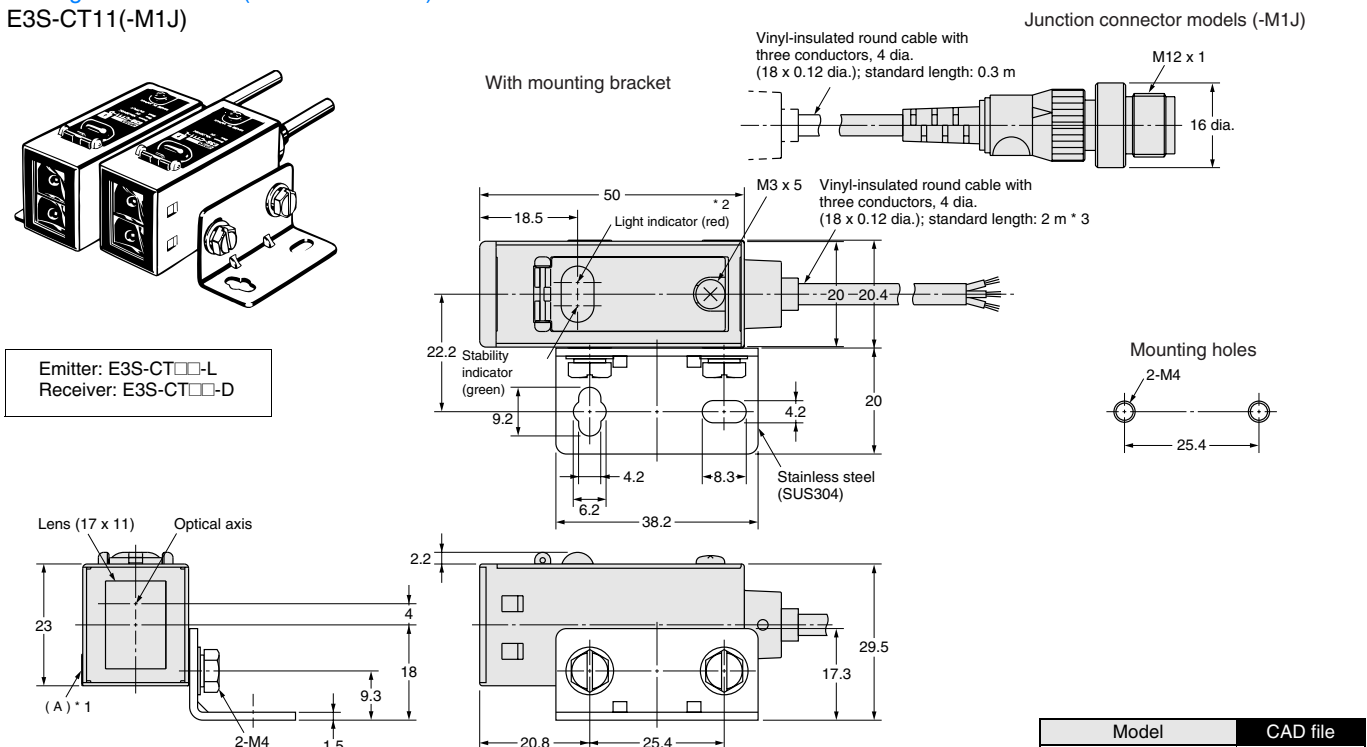
Note: 1. The E3S-C was immersed in the oils in the above table at 50°C for 240 hours, and passed the test of 100-MΩ or more insulation resistance.
 2. For use in the environment where the E3S-C is exposed to the oil other than those in the above table, use the dynamic viscosity and PH in the above table. Pre-examine the oils since the sensor may be affected by additives and like in the oils.

Dimensions (Unit: mm)

Sensors

Through-beam model (horizontal model)

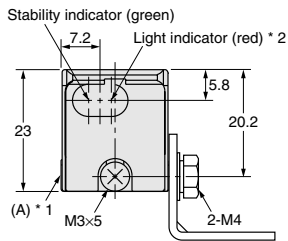
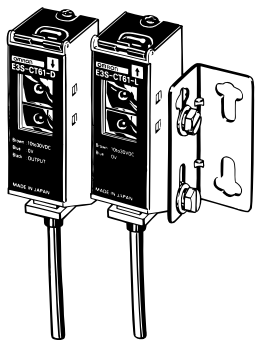
E3S-CT11(-M1J)



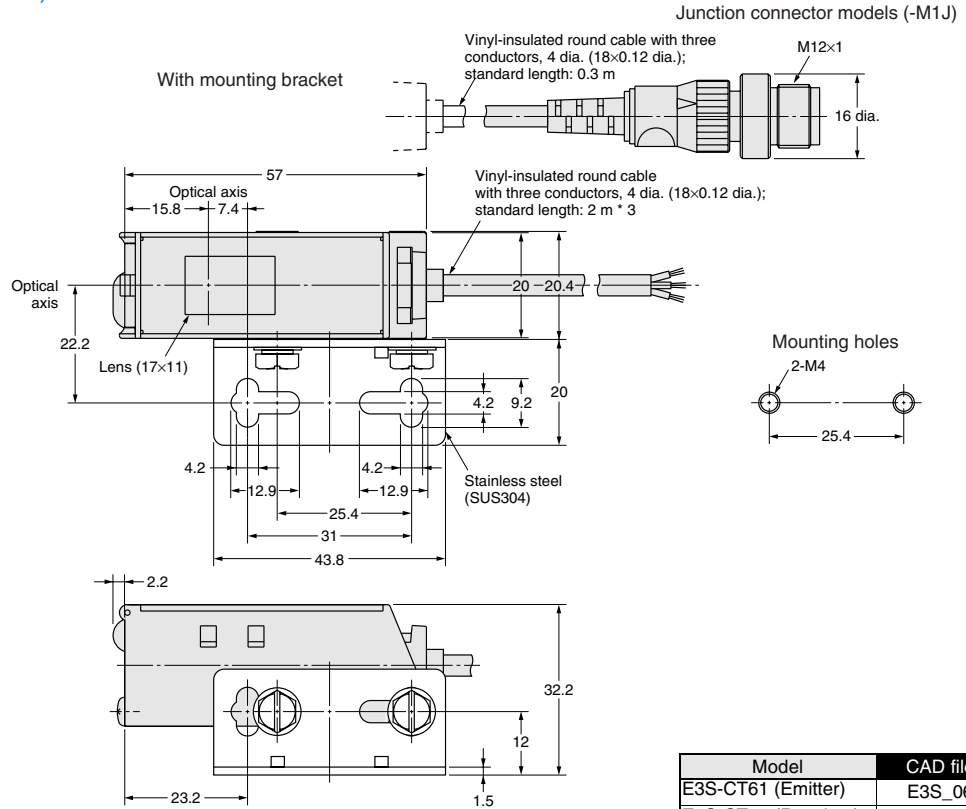
* Note: 1. Mounting bracket can be attached to side A.
 2. The emitter for through-beam sensors have only the power supply indicator.
 3. The cable for emitters for through-beam sensors is two-conductor, 4 dia. (27 x 12 dia.).

Model	CAD file
E3S-CT11 (Emitter)	E3S_08
E3S-CT11 (Receiver)	E3S_05
E3S-CT11-M1J	E3S_10

Through-beam model (vertical model)
E3S-CT61(-M1J)

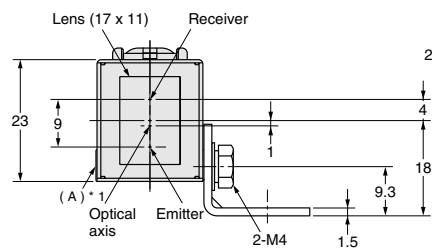
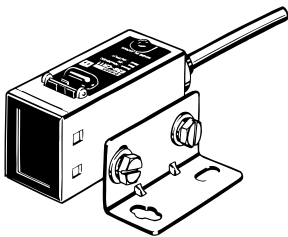


- * 1. Mounting bracket can be attached to side A.
- * 2. The emitter for through-beam sensors have only the power supply indicator.
- * 3. The cable for emitters for through-beam sensors is two-conductor, 4 dia. (27x12 dia.).

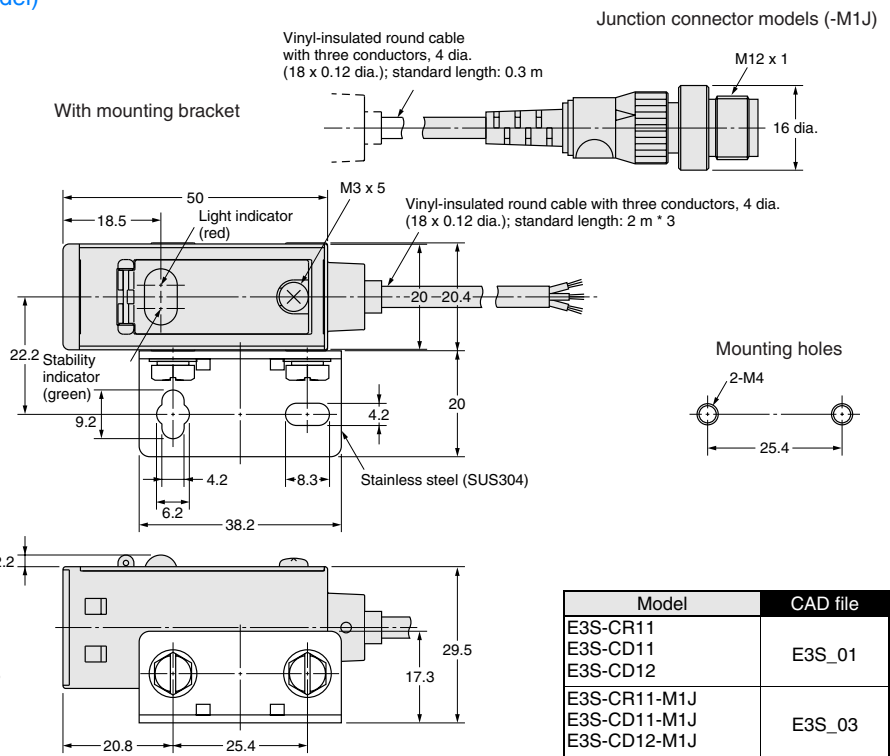


Model	CAD file
E3S-CT61 (Emitter)	E3S_06
E3S-CT61 (Receiver)	E3S_07
E3S-CT61-M1J	E3S_09

Retro/diffuse reflective model (horizontal model)
E3S-CR11(-M1J)
E3S-CD11(-M1J)
E3S-CD12(-M1J)



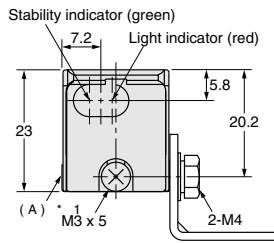
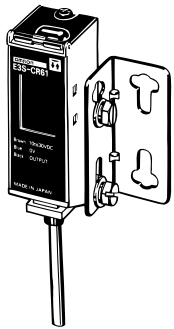
* Note: Mounting bracket can be attached to side A.



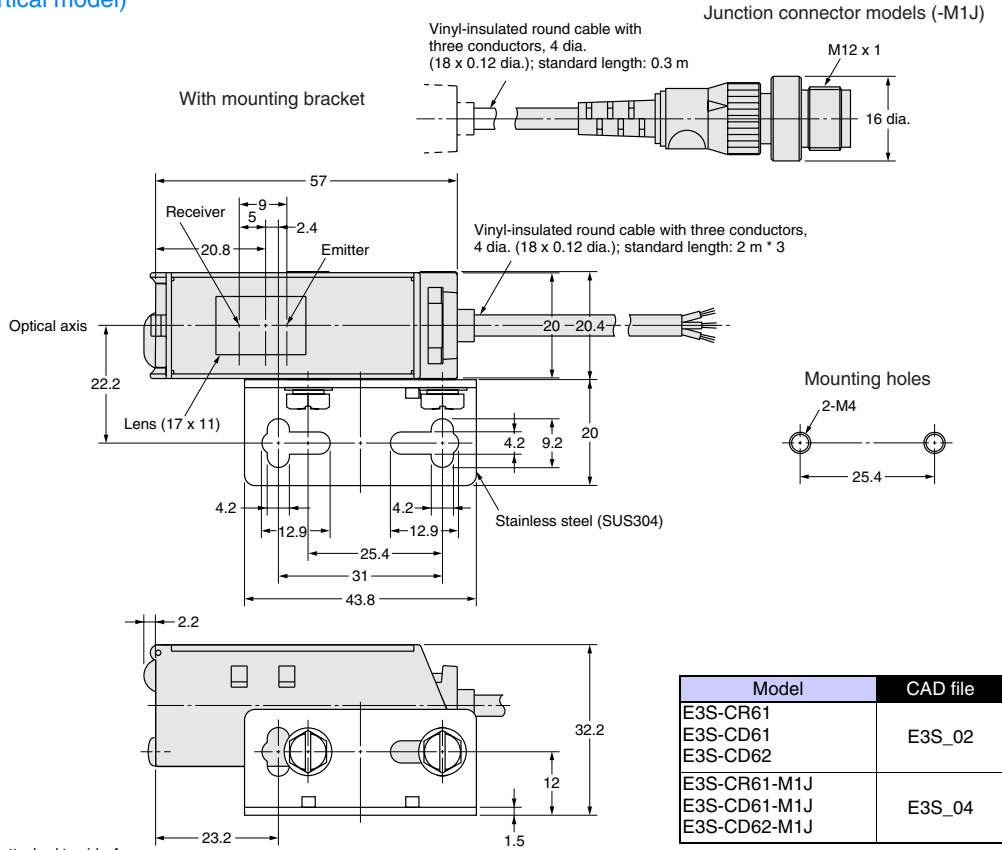
Model	CAD file
E3S-CR11	E3S_01
E3S-CD11	
E3S-CD12	
E3S-CR11-M1J	E3S_03
E3S-CD11-M1J	
E3S-CD12-M1J	

Retro/diffuse reflective model (vertical model)

- E3S-CR61(-M1J)
- E3S-CD61(-M1J)
- E3S-CD62(-M1J)



* Note: Mounting bracket can be attached to side A.

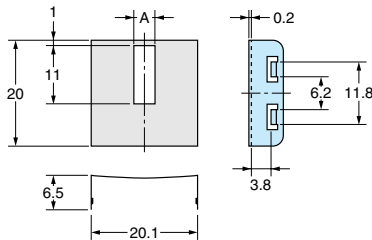
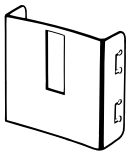


Model	CAD file
E3S-CR61	E3S_02
E3S-CD61	
E3S-CD62	
E3S-CR61-M1J	E3S_04
E3S-CD61-M1J	
E3S-CD62-M1J	

Accessories (Order Separately)

Plug-in type long slit (for through-beam model)

E39-S61



Dimension A (mm)	Material	Quantity
0.5	Stainless steel (SUS 304)	1 each for emitter and receiver (total of 8 pcs.)
1		
2		
4		

Distance setting photoelectric sensor (metal case)

E3S-CL

A complicated sensitivity adjustment is not necessary. Just set the distance to ensure a stable detection of works of various colors. New distance setting models of long-distance/oilproof/waterproof type and high-performance type



Features

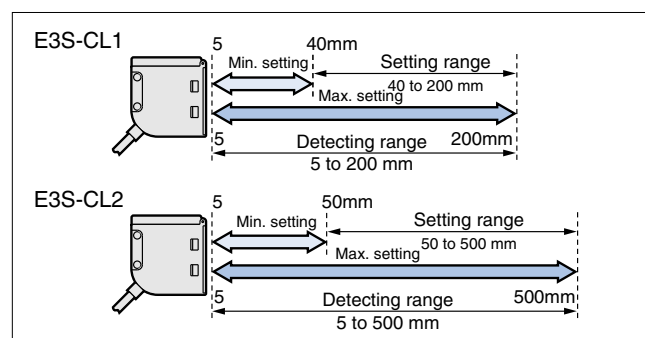
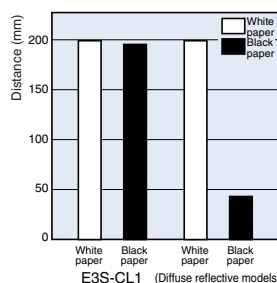
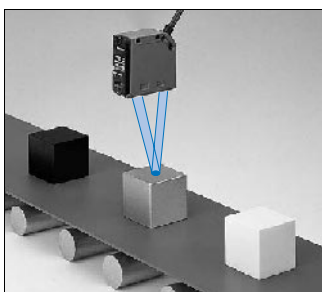
Stable Detection Regardless of Color, Material, or Size of a Detecting Object. Black/White Error of Only 2% max.

(E3S-CL1: Only 4 mm at 200 mm!)

The industry's minimum black/white error of only 2% (E3S-CL1). Like the conventional diffuse reflective model, the variation of the detecting distance has been minimized in a black object or a work of uneven color. This detection system is also resistant to contamination of the lens surface and work. The E3S-CL2 has a black/white error of 10%.

Compact and incl. a Long Detection Distance of 500 mm (E3S-CL2)

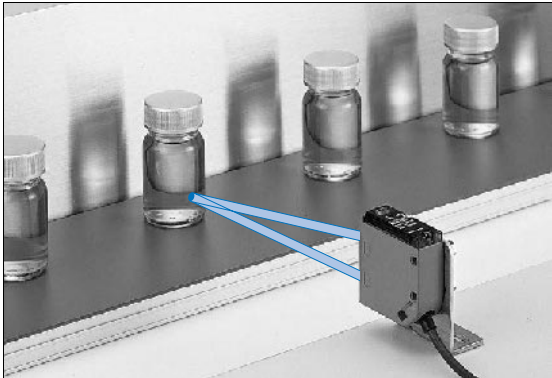
While the size is as compact as 40x42.6x15.4 mm, the E3S-CL2 using infrared LEDs ensures detection of 500-mm long distance. The E3S-CL1 using red LEDs has achieved the detecting distance of 200 mm.



Features

Eliminates Background Influences with a Hysteresis of Only 2% max. (E3S-CL1)

The hysteresis is the industry's minimum 2% max. (E3S-CL1). As a triangulation measuring is used, objects behind the setting distance cannot be detected. The sensor is insensitive to the influence of background objects of high reflectivity, and stable detects works on a conveyor from above. The hysteresis of the E3S-CL2 is 10% max. of the detecting distance (5% max. for white paper).



What Is Distance Setting?
(Differences from other detecting system)

Distance-setting

Features	<ul style="list-style-type: none"> When the sensing object moves in direction A, the center position of the reflected light moves in direction B. This is received by the 2-split photodiode and the place where the incident levels are the same on the N and F sides is defined as the setting distance. The object is detected by the incident circuit processing only when $N \geq F$, and is not detected when $N < F$. Therefore, detection is stable without being influenced by the work type and background objects.
Structure	

Diffuse-reflective

Features	<ul style="list-style-type: none"> Since the level of the reflected light is judged for detection, the sensing distance varies with the color, material and/or size of the work. A malfunction may occur if there is any object of high reflectivity in the background.
Structure	

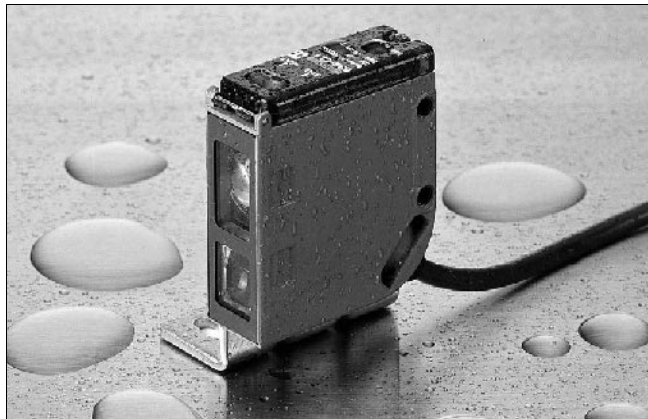
6-turn adjuster with indicator

- The 6-turn adjuster with indicator ensures ease of distance setting.
- Fine distance setting is possible.



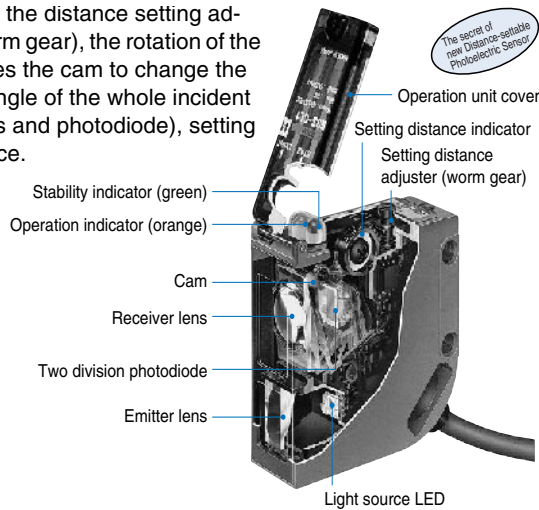
Solid Body Provides Excellent Durability

Has a sturdy metal body. Furthermore, the water resistance of IEC Standard IP67 and the oil resistance of IP67g (E3S-CL2) ensure a worry-free operation in a wide range of applications. E3S-CL2 uses an oil-resistant cable as standard.



Optical Technology of E3S-CL
(Patent pending)

By turning the distance setting adjuster (worm gear), the rotation of the gear moves the cam to change the incident angle of the whole incident block (lens and photodiode), setting the distance.

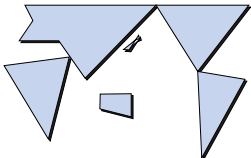


NPN/PNP Output is Switch Selectable

- Since NPN or PNP output can be selected with a single switch, one model meets equipment exported anywhere.
- Light-ON/Dark-ON is also switch selectable.

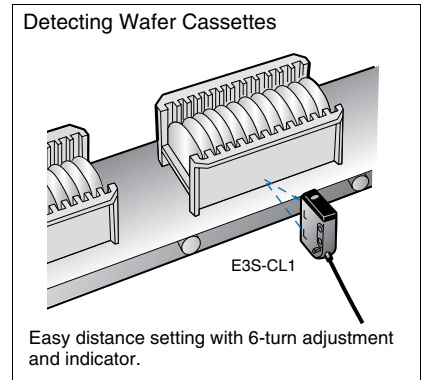
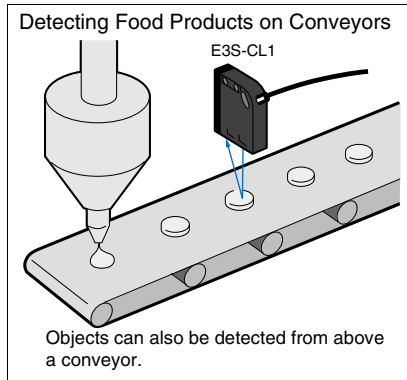
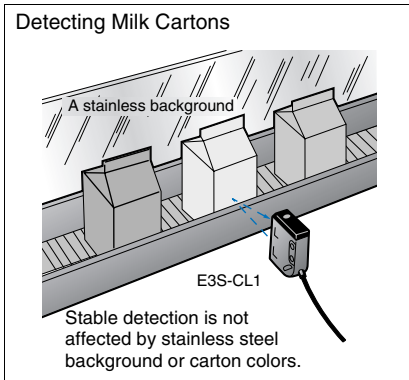
Conforms to Applicable EN/IEC Standards

- The sensors satisfy the electrical safety (IEC947-5-2), noise resistance (IEC947-5-2, IEC801-2/3/4) and noise radiation restrictions (EN500 81-2, EN55011) required for photoelectric sensors.

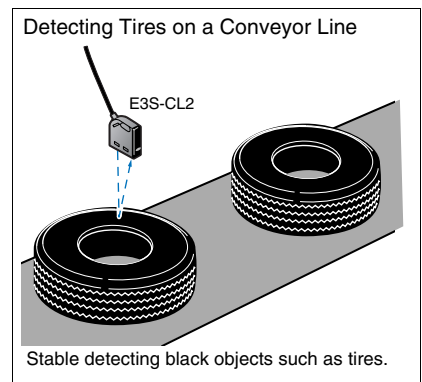
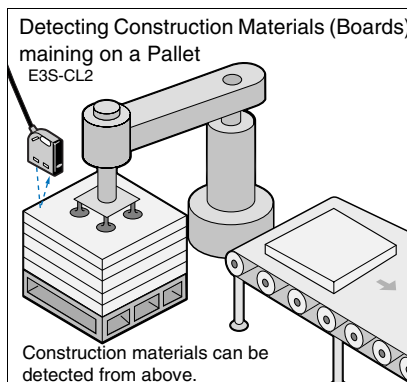
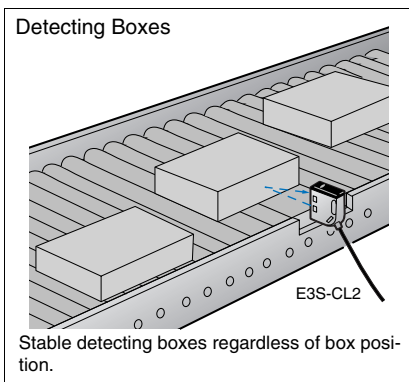


Application

E3S-CL1



E3S-CL2



Ordering Information

Red light Infrared light

Shape	Sensing/Setting range	Model
		E3S-CL1
		E3S-CL2

Rating/performance

Sensing method Item Model		Distance-setting	
		E3S-CL1	E3S-CL2
Sensing		5 to 200 mm (White paper 200 x 200 mm) (Setting distance 200 mm)	5 to 500 mm (White paper 200 x 200 mm) (Setting distance 500 mm)
Setting range		40 to 200 mm (White paper 200 x 200 mm)	50 to 500 mm (White paper 200 x 200 mm)
Differential distance		2% max.	10% max.
Reflectivity characteristics (black/white error) *1		2% max.	10% max.
Light source (wave length)		Red LED (700 nm)	Infrared LED (860 nm)
Power supply voltage		10 to 30 VDC [ripple (p-p) 10% included]	
Current consumption		35 mA max.	50 mA max.
Control output		Load 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 type (NPN/PNP switch selectable) Light-ON/Dark-ON switch selectable	
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention	
Response time		Operation or reset: 1 ms max.	Operation or reset: 2 ms max.
Distance setting		6-turn endless adjuster (with indicator)	
Ambient illuminance		Incandescent lamp: 5,000 lux max. Sunlight 10,000 lux max.	
Ambient temperature		Operating/Storage: -25°C to 55°C (with no icing or condensation)	
Ambient humidity		Operating/Storage: 35% to 85%RH (with no condensation)	
Insulation resistance		20 M Ω min. at 500 VDC	
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance		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 for 3 times each in X, Y, and Z directions	
Protective structure		IEC Standard IP67, NEMA 6P (limited to indoor use) *2	IEC Standard IP67, NEMA 6P (limited to indoor use)
Connection method		Pre-wired models (standard length: 2 m)	
Weight (Packed state)		Approx. 170 g	
Ma- terial	Case	Zinc diecast	
	Operation panel cover	Polyethyl sulfon	
	Lens	Acrylics	
	Mounting Brackets	Stainless steel (SUS304)	
Accessories		Mounting bracket, hexagon bolt M4 x 12 (with spring washer, flat washer), adjusting screwdriver, instruction manual	

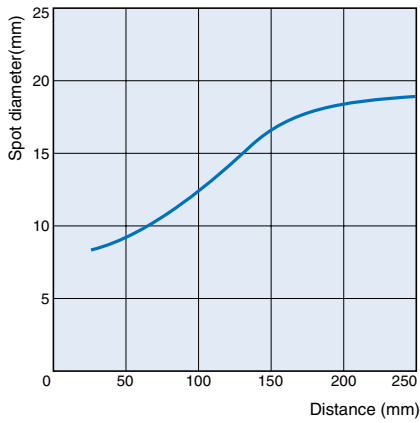
*1. Sensing distance difference between standard white paper (reflectivity 90%) and standard black paper (reflectivity 5%)

*2. NEMA (National Electrical Manufacturers Association) Standards

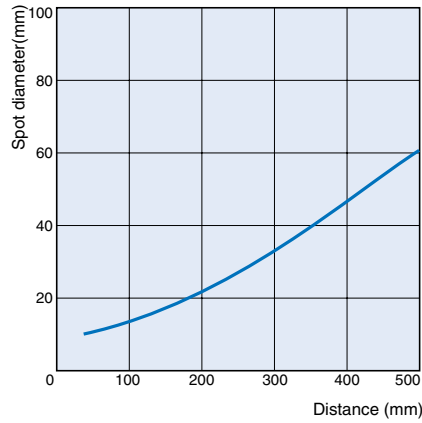
Characteristic data (typical)

Spot Diameter vs. Sensing Distance

E3S-CL1

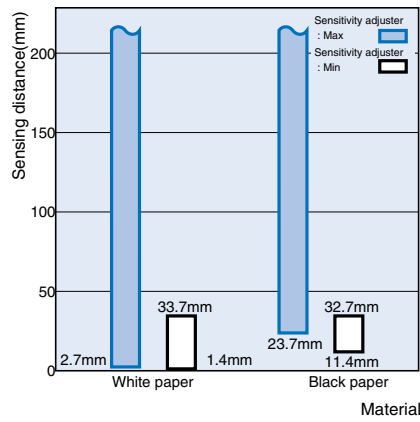


E3S-CL2

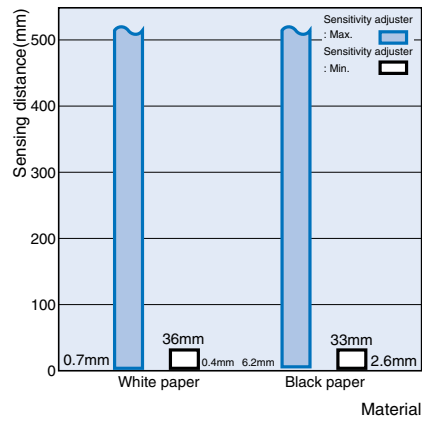


Short distance characteristic

E3S-CL1



E3S-CL2



Output Circuit Diagram

NPN output

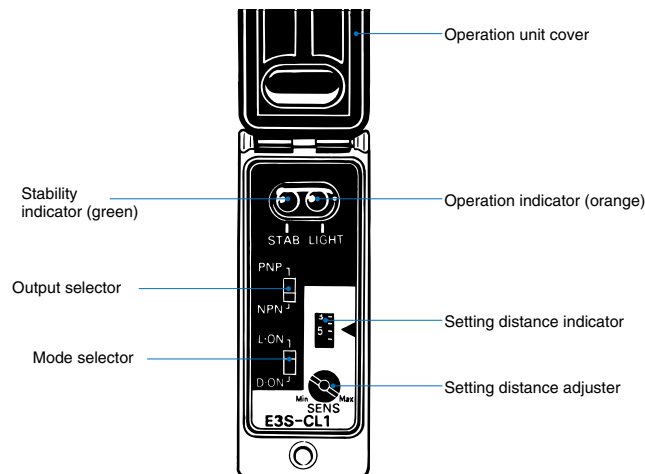
Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CL1 E3S-CL2	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load Operate (Relay) Reset	L•ON (LIGHT ON)	
	Dark ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load Operate (Relay) Reset	D•ON (DARK ON)	

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CL1 E3S-CL2	Light ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load Operate (Relay) Reset	L•ON (LIGHT ON)	
	Dark ON	Incident Interrupted Operation indicator (orange) ON OFF Output transistor ON OFF Load Operate (Relay) Reset	D•ON (DARK ON)	

Nomenclature:

Operation panel



Output selection switch

- ① When using the sensor with NPN output, move the switch to the **NPN** position.
- ② When using the sensor with PNP output, move the switch to the **PNP** position.

Mode selection switch

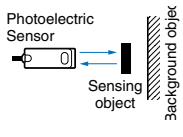
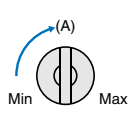
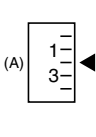


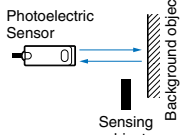
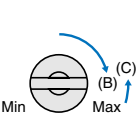
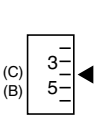


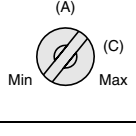
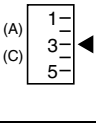


- ① When using the sensor with Light-ON, move the switch to the **L•ON** position.
- ② When using the sensor with Dark-ON, move the switch to the **D•ON** position.

Distance Adjuster

- ① Turning the distance setting adjuster clockwise (to the Max position) increases the detecting distance, and turning it counterclockwise (to the Min position) decreases the distance.
- ② The distance setting adjuster is a 6-turn endless adjuster ranging from the Min position to the Max position, and its number of turns is displayed on the setting distance indicator according to the rotation of the adjuster.

Operation

Sensitivity adjustment (distance setting type, Light-ON)

Sequence	Detection state	Position of distance setting adjuster	State of setting distance indicator	Indicator state	Adjustment Steps
(1) Point (A)				ON→OFF OFF→ON   Stability indicator (green) Operation indicator (orange)	Place a sensing object in the predetermined position, turn the adjuster clockwise until the incident indicator (orange) is turned ON, and define this position as (A).
(2) Points (B), (C)				ON→OFF ON→OFF   Stability indicator (green) Operation indicator (orange)	(1) If there is a background object, remove the sensing object, turn the adjuster further clockwise until the incident indicator (orange) is turned ON, and define this position as (B). Turn the adjuster counterclockwise from (B) until the incident indicator (orange) is turned OFF, and define this position as (C). (2) If there is no background object, define the maximum adjuster position (Max) as (C).
(3) Setting	---			ON ON↔OFF   Stability indicator (green) Operation indicator (orange)	Set the adjuster in the middle of positions (A) and (C). Also make sure that the stability indicator (green) is turned ON when there is an object and when there is no object. When the indicator is not turned ON, reexamine the detection method since there is a little allowance.

Precautions

Correct Use

Design

Cable

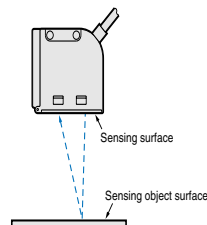
The oil-resistant cable is used to ensure oil resistance. (E3S-CL2)

Installation

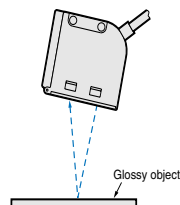
Sensor installation

Mounting orientation

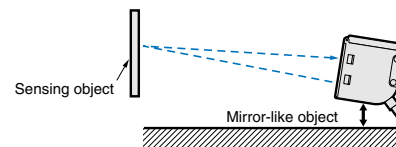
- Install the photoelectric sensor in such manner that its detection surface and the object surface are parallel (without inclination relative to the sensing object).



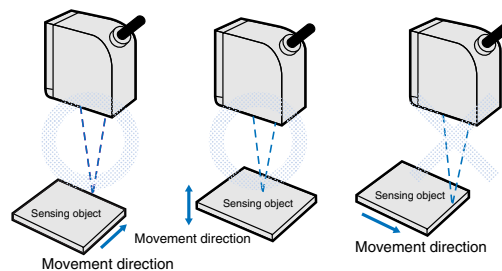
If the sensing object has a glossy surface, incline the Sensor by 5° to 10° as shown on the right. In this case, ensure that the Sensor is not influenced by any background objects.



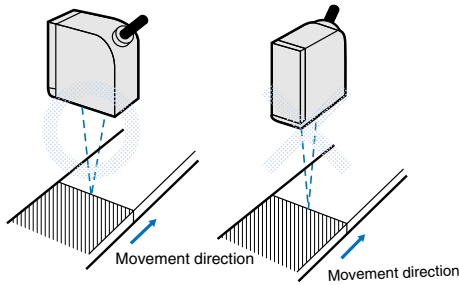
- If there is a mirror-smooth object under the photoelectric sensor, operation may become unstable. Therefore, incline the photoelectric sensor as shown below or move it away from the object.



- Install the photoelectric sensor in either of the following orientations, being careful of the direction in which the sensing object will move.



- Also, when the color/material of the sensing object varies extremely, install the photoelectric sensor in either of the following orientations.



- Install the photoelectric sensor so that the sun, fluorescent lamp, incandescent lamp or any other strong light will not enter the directional angle range of the sensor.

Mounting Precautions

- Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will lose its water-resistive properties.
- Use M4 screws.
- Tighten the screws to the torque of 1.2 Nm max.

Others

Oil resistance/chemical resistance (E3S-CL2)

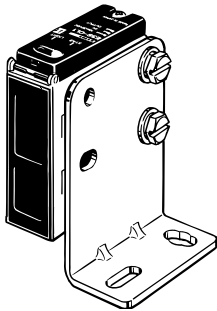
For the oil resistance of E3S-CL2, the Sensor has passed tests on the oils given in the following table. Refer to the table for examining the oil to be used. Depending on the oil type, however, the Sensor may not be able to exhibit its performance.

Testing oil classification	JIS classification	Product name	Dynamic viscosity (mm ² /s) at 40°C	PH
Lubricant	---	Velocity No. 3	2.02	
Water-insoluble coolant	Class 2 No. 5	Daphne Cut	Not less than 10 to less than 50	---
	Class 2 No. 11	Yushiron Oil No. 2ac	Less than 10	
Water-soluble coolant	Class W1 No. 1	Yushiroken EC50T-3	---	7'9.5
		Yushiron Lubic HWC68		7'9.9
	Class W1 No. 2	Gryton 1700D		7'9.2
	Class W2 No. 1	Yushiroken S50N		7'9.8

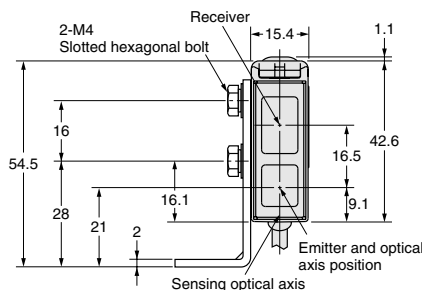
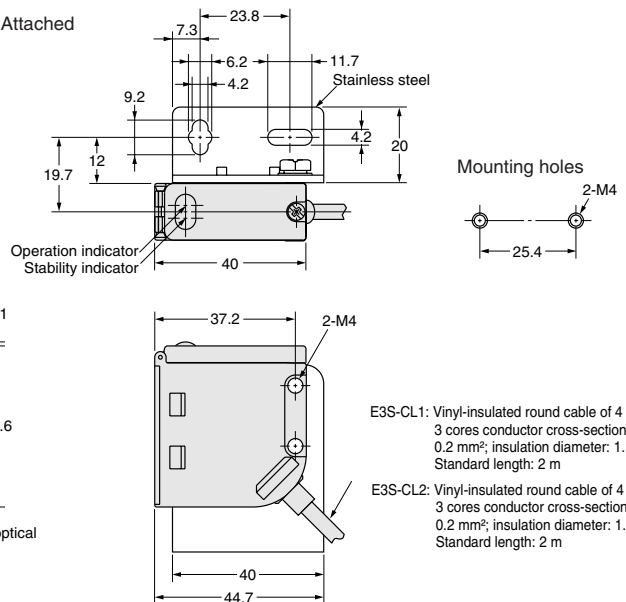
Note: 1. E3S-C was submerged in the oils in the above table at 50°C for 240 hours, and passed the test of 100-MΩ or more insulation resistance.
 2. For use in the environment where E3S-C is exposed to the oil other than those in the above table, use the dynamic viscosity and PH in the above table. Pre-check the oils since the sensor may be affected by additives etc. in the oils.

Dimensions (Unit: mm)

E3S-CL1
E3S-CL2



With Mounting Bracket Attached



E3S-CL1: Vinyl-insulated round cable of 4 dia. 3 cores conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm Standard length: 2 m
 E3S-CL2: Vinyl-insulated round cable of 4 dia. 3 cores conductor cross-sectional area: 0.2 mm²; insulation diameter: 1.1 mm Standard length: 2 m

CAD file E3S_11

Note: The output selector, mode selector and distance setting adjuster are exposed when the cover is opened.

Photoelectric switch with built-in amplifier (long distance)

E3G

Long-distance Retroreflective Photoelectric Sensor with a Sensing Distance of 10 m Sensor with Distance Setting up to 2 m

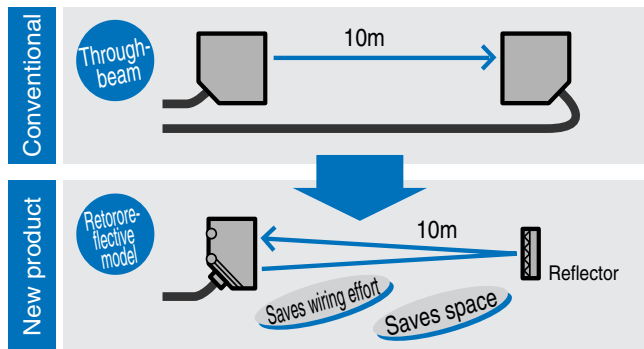


Features

Retroreflective Models

Though the Size Is Compact, the Sensing Distance Is as Long as 10m.

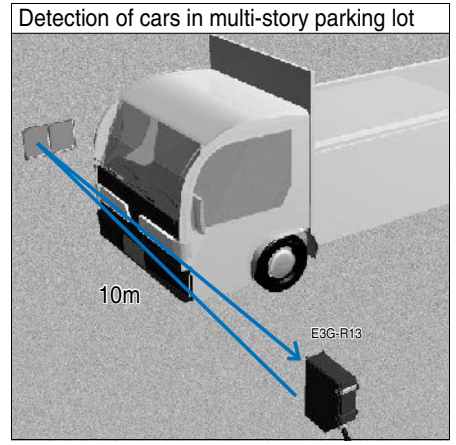
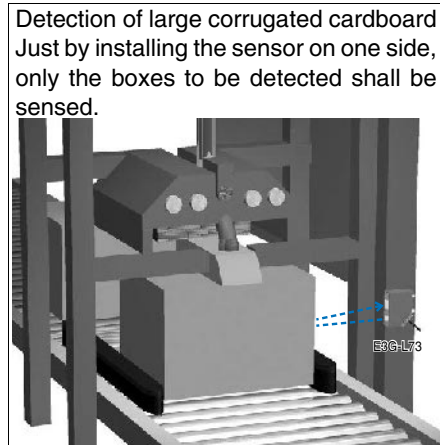
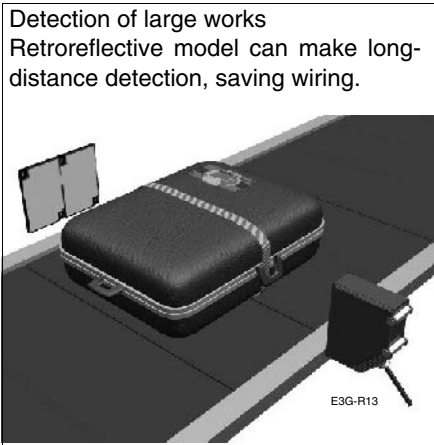
Replace the conventional through-beam model with the retroreflective model for saving wiring and installation space.



Easy monitoring of Operation stability by means of stability indicator.



Application



E3G

Features

Distance-setting

Distance-setting Models with a Long 2-m Sensing Distance Incorporate a Teaching Function

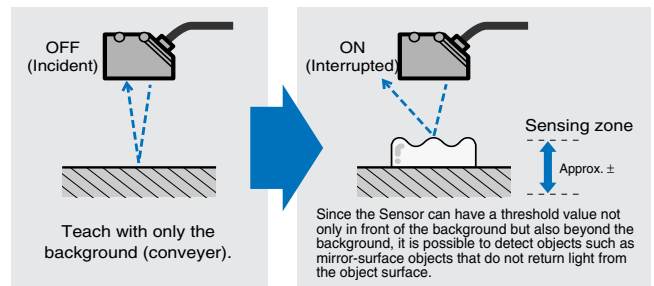
Sensitivity adjustment without being influenced by background objects is possible by simply pressing a button. Useful for teaching without a sensing object.

Easy Optimum Sensing Distance Adjustments

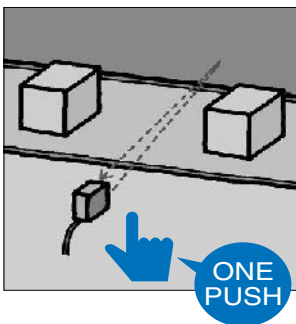
Teaching with and without a sensing object ensures highly accurate detection without influence from the background.

Zone Setting Function

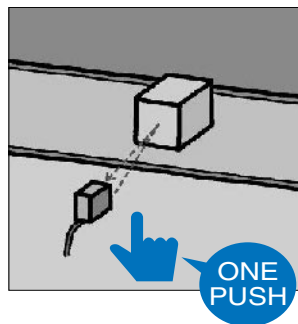
Effective for detecting glossy objects, which were difficult to detect with conventional sensors. (D-ON)



Without sensing object



With sensing object



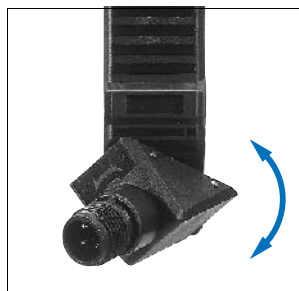
General

Select either transistor (NPN/PNP selectable) or relay output. Three connection methods (plus a model with a timer function). Select either a DC power supply or a variable power supply: 24 V to 240 VAC or 12 to 240 VDC).

IEC Standard IP67 Water Proofing



M12 Rotary Connector Available on Models with DC Power Supplies



Ordering Information

Sensors

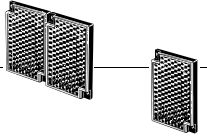
Red light Infrared light

Sensor type	Shape	Connection method	Sensing distance	Timer function	Model	
					NPN/PNP selector	Relay contact output
Retroreflective Models (with M.S.R. Function)		Pre-wired		---	E3G-R13-G	---
		Connector type			E3G-R17-G	
		Terminal block			---	E3G-MR19-G
Distance-setting		Pre-wired	White paper 300 × 300 mm 	---	E3G-L73	---
		Connector type			E3G-L77	
		Terminal block			---	E3G-ML79-G
				ON or OFF delay 0 to 5 s (adjustable)	---	E3G-ML79T-G

* Values in parentheses indicate the minimum required distance between the sensor and reflector.


Accessories (Order Separately)

Reflectors

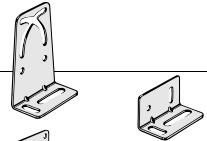
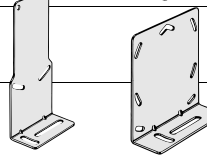
Shape	Sensing distance (typical)	Model	Quantity	Remarks
	10 m (500 mm) *	E39-R2	1	---
	6 m (100 mm) *	E39-R1S	1	---

* Values in parentheses indicate the minimum required distance between the sensor and reflector.



Terminal Protection Cover for Side-pullout Cable

Shape	Model	Quantity	Applicable type	Remarks
	E39-L129-G	1	E3G-MR19(T)-G E3G-ML79(T)-G	Provided with rubber bushing and cap for pullout prevention in horizontal direction

Mounting Brackets

Shape	Model	Quantity	Applicable type	Remarks
	E39-L131	1	E3G-R1□ E3G-L7□	---
	E39-L132	1		Rear-mounting use
	E39-L135	1	E3G-MR19(T)-G E3G-ML79(T)-G	Cable pulled out downwards
	E39-L136	1		---

Sensor I/O Connectors

Cable	Shape	Cable length	Model
Standard cable	Straight 	2 m	XS2F-D421-DC0-A
		5 m	XS2F-D421-GC0-A
	L-shaped 	2 m	XS2F-D422-DC0-A
		5 m	XS2F-D422-GC0-A

Rating/Performance

Sensor type		Retroreflective Models (M.S.R. function)				Distance-setting				
Item	Model	E3G-R13-G	E3G-R17-G	E3G-MR19-G	E3G-MR19T-G	E3G-L73	E3G-L77	E3G-ML79-G	E3G-ML79T-G	
Sensing distance	10 m (500 mm) * (When using the E39-R2)					0.2 to 2 m (White paper 300 x 300 mm)				
Setting distance	---					0.5 to 1.2 m (White paper 300 x 300 mm)				
Standard sensing object	Opaque: 80 dia. min.					---				
Hysteresis (typical)	---					10% of setting distance				
Directional angle	Sensor: 1° to 5°					---				
Reflectivity characteristics (black/white error)	---					±10% max. (At detection distance of 1m)				
Light source (wave length)	Red LED (700 nm)					Infrared LED (860 nm)				
Spot size	---					70 mm dia. max. (At detection distance of 1m)				
Power supply voltage	10 to 30 VDC [Ripple (p-p) 10% included]			12 to 240 VDC ±10% ripple (p-p) : 10% max. 24 to 240 VAC ±10% 50/60 Hz		10 to 30 VDC (Ripple (p-p) 10% included)		12 to 240 VDC ±10% ripple (p-p) : 10% max. 24 to 240 VAC ±10% 50/60 Hz		
Current/Power consumption	50 mA max.			2 W max.		60 mA max.		2 W max.		
Control output	Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage NPN output: 1.2 V max., PNP output: 2 V max.) Open collector output type (NPN/PNP output switch selectable) L-ON/D-ON switch selectable			Relay output: Switch-over contact 250 VAC 3A (cosφ=1) max. 30 VDC 3A max. L-ON/D-ON switch selectable		Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage NPN output: 1.2 V max., PNP output: 2 V max.) Open collector output type (NPN/PNP output switch selectable) L-ON/D-ON switch selectable		Relay output: Switch-over contact 250 VAC 3A (cosφ=1) max. 30 VDC 3A max. L-ON/D-ON switch 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)	
Protective circuits	Reverse polarity protection, output short-circuit protection, mutual interference prevention			Mutual interference prevention function		Reverse polarity protection, output short-circuit protection, mutual interference prevention		Mutual interference prevention function		
Response time	Operation/reset: 1 ms each			Operation/reset: 30 ms each		Operation/reset: 5 ms each		Operation/reset: 30 ms each		
Sensitivity adjustment	One-turn adjuster					Teaching method (NORMAL mode/ZONE mode)				
Timer function	---			ON delay/ OFF delay 0 to 5 s (Adjuster variable system)		---		ON delay/ OFF delay 0 to 5 s (Adjuster variable system)		
Ambient illuminance	Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.									
Ambient temperature	Operating: -25°C to 55°C, Storage: -30°C to 70°C (with no icing or condensation)									
Ambient humidity	Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)									
Insulation resistance	20 M Ω min. at 500 VDC									
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute			2,000 VAC at 50/60 Hz for 1 minute		1,000 VAC at 50/60 Hz for 1 minute		2,000 VAC at 50/60 Hz for 1 minute		
Vibration resistance	Destruction: 10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions									

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Sensor type	Retroreflective Models (M.S.R. function)				Distance-setting			
Item Model	E3G-R13-G	E3G-R17-G	E3G-MR19-G	E3G-MR19T-G	E3G-L73	E3G-L77	E3G-ML79-G	E3G-ML79T-G
Shock resistance	500 m/s ² 3 times in each of X, Y and Z directions							
Protective structure	IEC 60529 IP67 (with Protective Cover attached)							
Connection method	Pre-wired (standard length: 2 m)	M12 Connector	Terminal block		Pre-wired (standard length: 2 m)	M12 Connector	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	Acrylics (PMMA)						
	Mounting Brackets	Stainless steel (SUS304)						
Accessories	Instruction sheet, and screwdriver for adjustment				Instruction sheet			

Output Circuit Diagram

NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3G-R13-G E3G-R17-G E3G-L73 E3G-L77	Light ON		L•ON (LIGHT ON)	<p>* Set the NPN or PNP selector to NPN</p> <p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>
	Dark ON		D•ON (DARK ON)	

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3G-R13-G E3G-R17-G E3G-L73 E3G-L77	Light ON		L•ON (LIGHT ON)	<p>* Set the NPN or PNP selector to PNP</p> <p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>
	Dark ON		D•ON (DARK ON)	

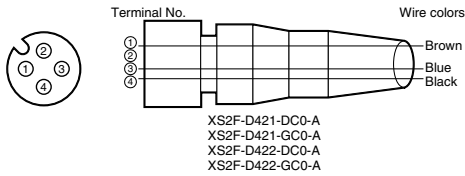
Relay contact output

Timer function	Model	Timing chart	Mode selection switch	Output circuit
None	E3G-MR19-G E3G-ML79-G		L•ON (LIGHT ON)	<p>24 to 240 VAC 12 to 240 VDC (no polarity order restricted)</p>
			D•ON (DARK ON)	
ON or OFF delay 0 to 5 s (adjustable)	E3G-MR19T-G E3G-ML79T-G		L•ON (LIGHT ON)	
			D•ON (DARK ON)	

* For ON and OFF, delay timers vary independently.

Note: Td1, Td2: Delay time (0 to 5 s), T1: Any period longer than delay time, T2: Any period shorter than delay time

Connectors (Sensor I/O connectors)



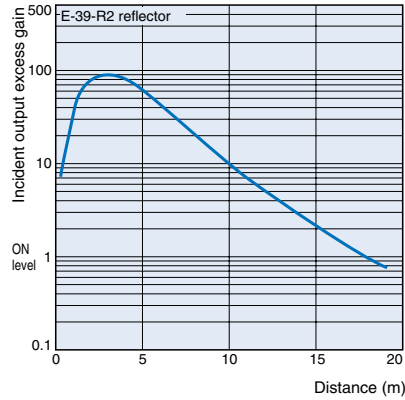
Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	Power supply (+V)
	-	②	-
	Blue	③	Power supply (0 V)
	Black	④	Output

Note: Pin 2 is not used.

Characteristic data (typical)

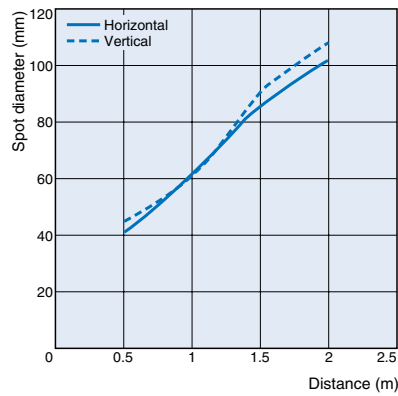
E3G-R/MR Retroreflective Models

Operating Range

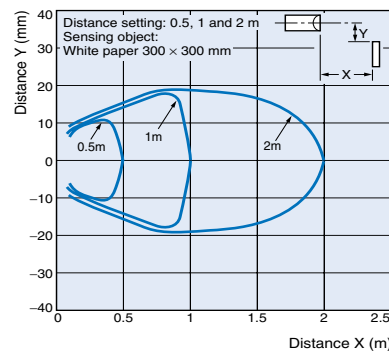


E3G-L/ML Distance-setting Models

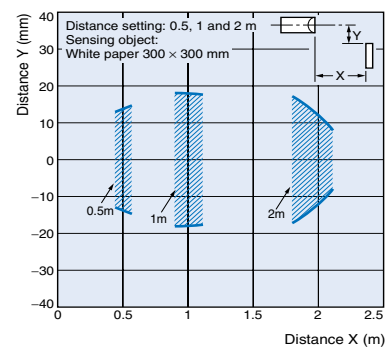
Spot Diameter vs. Sensing Distance



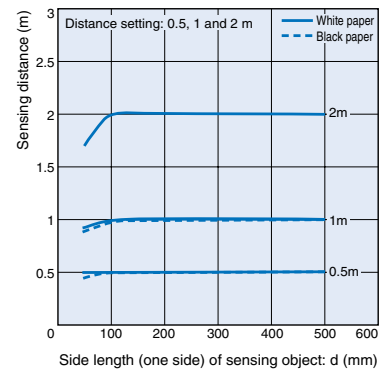
Sensing Zone (in NORMAL mode)



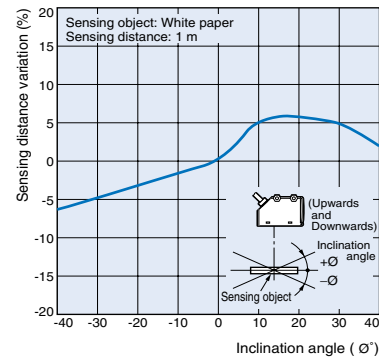
Sensing Zone in ZONE Mode



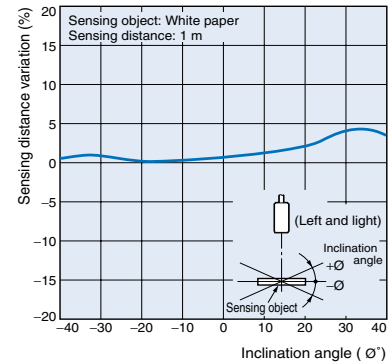
Sensing Object Size vs. Setting Distance



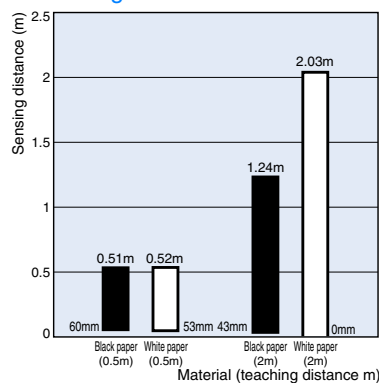
Sensing Object Angle Characteristics (Up and Down)



Sensing Object Angle (Left and Right)



Close-range Characteristics

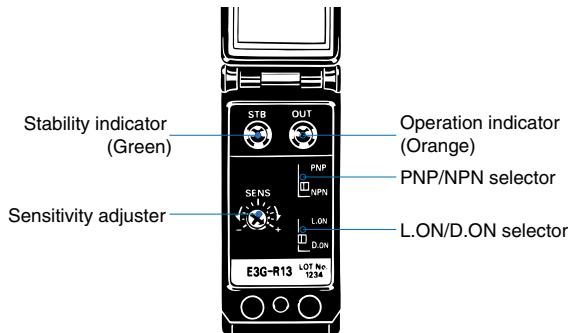


Nomenclature

Retroreflective Models

E3G-R13-G (Pre-wired model)

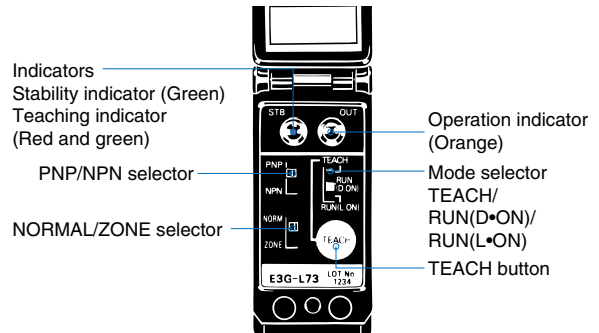
E3G-R17-G (Connector model)



Distance-setting

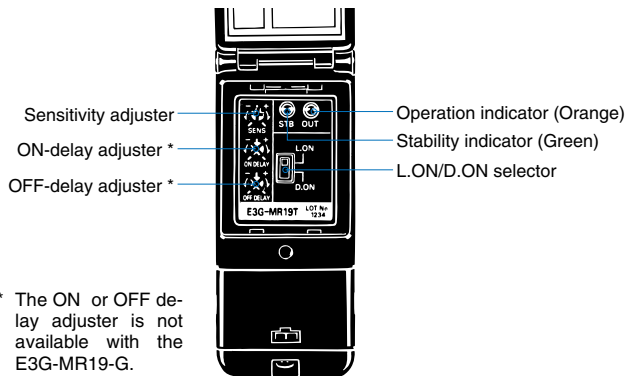
E3G-L73 (Pre-wired model)

E3G-L77 (Connector model)



E3G-MR19-G (Terminal Block Model)

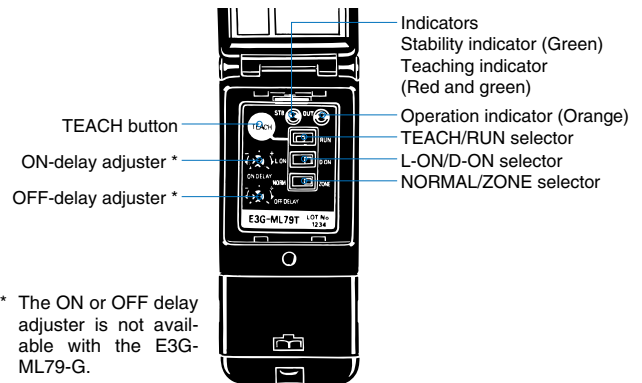
E3G-MR19T-G (Terminal Block Model with Timer)



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

E3G-ML79-G (Terminal Block Model)

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



* The ON or OFF delay adjuster is not available with the E3G-ML79-G.

Operation

E3G-L/ML

Adjustment Steps

Proce- dure	Operation
1	Install, wire, and turn on the Sensor.
2	Perform distance setting (teaching). Refer to "Distance Setting (Teaching)".
3	Check that the mode selector is set to RUN.

Distance Setting (Teaching)

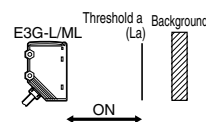
Select the most appropriate teaching method in reference to the following descriptions.

Application	Teaching without sensing objects (i.e., Teaching the background).	Setting a threshold in the middle between the background and sensing object for operation.	Detection of glossy objects in front of the background.	Setting the maximum sensing distance of the Sensor.
Teaching	Normal one-point teaching	Normal two-point teaching	Zone teaching	Maximum distance setting (in normal mode)
Setting method	Press the TEACH button with the background object.	Press the TEACH button with the background object.	Press the TEACH button with the background object (conveyor, etc.).	Press the TEACH button for longer than three seconds.
Set threshold	Threshold (a) is set to a distance in front of the background of 20% of the background distance.	Threshold (a) is set approximately in the middle between the background and sensing object.	Thresholds (a and b) are set in the sensing distance on condition that the difference between these thresholds is approximately 10% of the whole sensing distance.	The threshold is set in such manner that the stability indicator will turn ON at approximately 2 m if the sensing object is white paper.
Output ON range	The output is ON between the Sensor and La.	The output is ON between the Sensor and La.	The output is ON between La and Lb.	The output is ON whenever the sensing object is located between the Sensor and at a distance of 2.2 m.

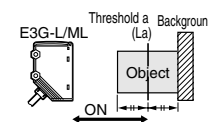
La: Distance equivalent to threshold (a)

Lb: Distance equivalent to threshold (b)

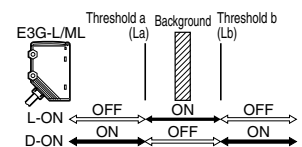
Normal Mode1. Normal One-point Teaching



2. Normal Two-point Teaching



Zone Mode Zone Teaching



Normal one-point teaching

Proce- dure	Operation
1	Set the mode selector to TEACH .
2	Set the NORMAL/ZONE mode selector to NORMAL .
3	Press the TEACH button with the background. • The teaching indicator (red) will turn ON.
4	Set the mode selector to RUN . (Set to L-ON or D-ON mode.)

Note: Perform normal one-point teaching with the background.

Normal two-point teaching

Proce- dure	Operation
1	Set the mode selector to TEACH .
2	Set the NORMAL/ZONE mode selector to NORMAL .

Proce- dure	Operation
3	Press the TEACH button with a sensing object. • The teaching indicator (red) will turn ON.
4	Move the sensing object and press the TEACH button with the background. • If the teaching is successful, the teaching indicator (green) will turn ON. • If the teaching is not successful, the teaching indicator (red) will flash.
5	When the teaching is successful, the setting is complete. Set the mode selector to RUN . (Use the operation mode selector to set L-ON/D-ON.) → When the teaching is not successful, change the work position and setting distance again, and restart the setting from step "3".

Zone teaching

Pro- ce- dure	Operation
1	Set the mode selector to TEACH .
2	Set the NORMAL/ZONE mode selector to ZONE .
3	Press the TEACH button with the background. • The teaching indicator (red) will turn ON and the teaching indicator (green) will then turn ON.
4	Set the mode selector to RUN . (Set to L-ON or D-ON mode.)

Note: Perform zone teaching with the background.

Maximum distance setting (in normal mode)

If you want to set the maximum distance of the sensor, set a maximum distance as depicted in the following procedure.

Pro- ce- dure	Operation
1	Set the mode selector to TEACH .
2	Set the NORMAL/ZONE mode selector to NORMAL .
3	Press the TEACH button 3 s or more. • The teaching indicator (red) will turn ON. • In 3 s, the teaching indicator (green) will turn ON.
4	When the teaching indicator (green) turns ON, the setting is complete. Set the mode selector to RUN . (Set to L-ON/D-ON.)

Precautions

Correct Use

E3G-R/MR

Design

Power Supply

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

Wiring Considerations

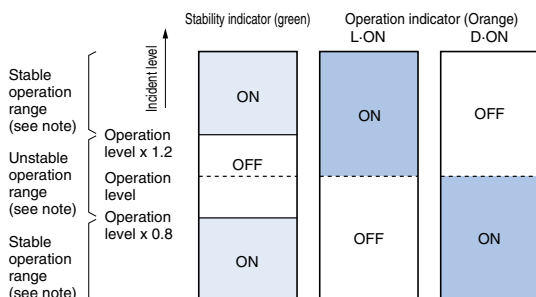
The tensile strength of the cable during operation should not exceed the values shown below.

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

● For adjustment

Display

- The following graphs indicate the status of each operation level.
- Set the E3G so that it will work within the stable operation range.



Note: If the operation 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.

E3G-L/ML

Design

Power Supply

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

Wiring Considerations

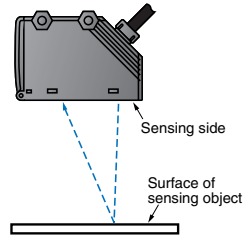
The tensile strength of the cable during operation should not exceed the values shown below.

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

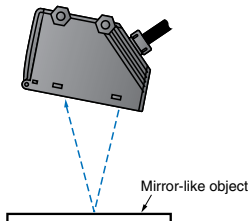
Mounting

Mounting Directions

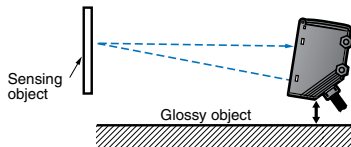
- Install the photoelectric sensor in such way that its detection surface and the object surface are always parallel (without inclination relative to the sensing object).



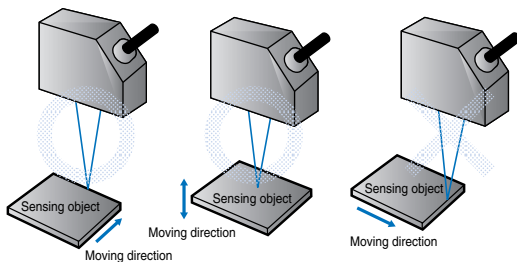
If the sensing object has a glossy surface, incline the Sensor by 5° to 10° as shown on the right, provided that the Sensor is not influenced by any background objects.



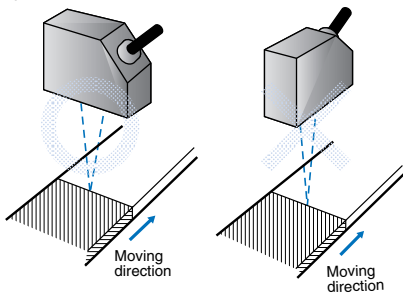
- If there is a mirror-like object below the Sensor, the Sensor may not be in stable operation. Therefore, incline the Sensor or keep the Sensor a distance away from the mirror-like object as shown below.



- Ensure 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.



Miscellaneous

EEPROM Write Error

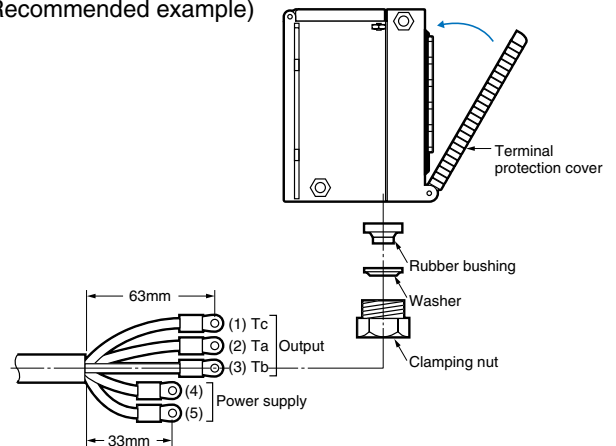
If a write error occurs (operation indicator flickers) due to power-off, static electricity or other noise in the teaching mode, perform teaching again.

E3G-M□(T)-G

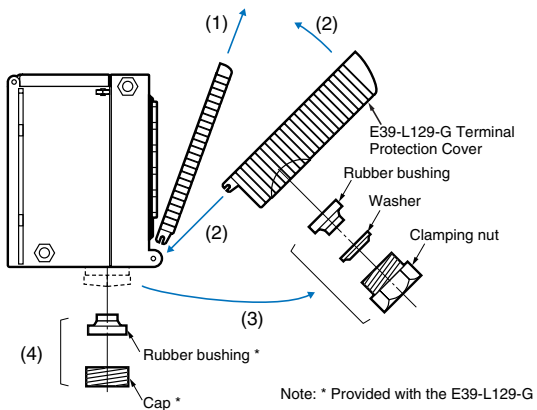
Wiring Considerations

- The cable with an external diameter of 6 to 8 mm is recommended.
- Securely tighten the cover to maintain water resistance and dust resistance. The thread size of the conduit socket is PG 13.5
- Do not tighten with the cable caught by the terminal protection cover. Otherwise, the water-resistant structure and like cannot be maintained.

(Recommended example)



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



Note: * Provided with the E39-L129-G

Pro-cedure	Operation
①	Remove the present cover.
②	Attach the E39-L129-G 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-G to the E3G as replacements.

All E3G Models

Design

[Load Relay Contact](#)

If a load is used that will spark when it is turned OFF (e.g. a contactor or valve), the usually closed side may be turned ON before the usually open side is turned OFF or vice versa. If both usually open output and usually closed output are used simultaneously, apply a surge suppressor to the load. (Refer to OMRON's "Switch/Relay/Connector (PCB Product) Catalog" for typical examples of surge suppressors.)

Wiring Considerations

[Connection/Wiring](#)

The E3G has load short-circuit protection. If load short-circuit or like has occurred, the output turns OFF. Therefore, recheck the wiring and switch power on again. This resets the short-circuit protection circuit. Load short-circuit protection is activated when a current of 2 times or more of the rated load current flows. When using an L load, use the one the inrush current of which is less than 1.2 times of the rated load current.

Mounting

- If Sensors are mounted face-to-face, ensure 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 lose its water-resistive properties.
- Use M4 screws for Sensor installation.
- For case installation, tighten it to the torque of 1.2 Nm max.

Water Resistance

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

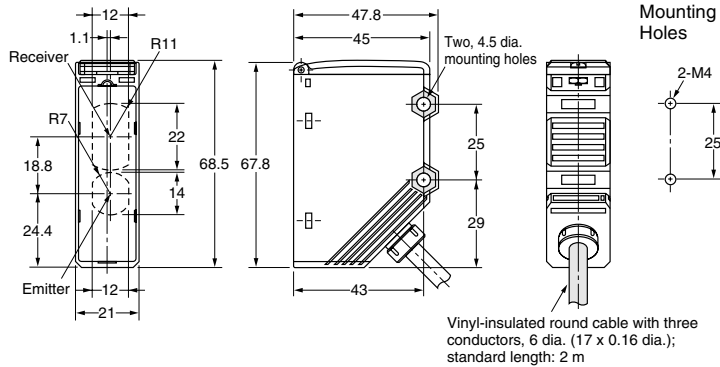
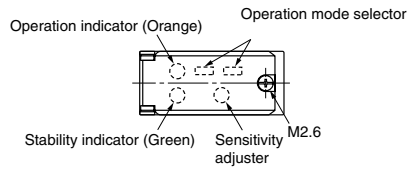
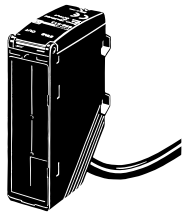
Dimensions (Unit: mm)

Sensors

Retroreflective Models

Pre-wired

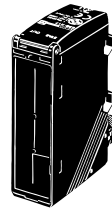
E3G-R13-G



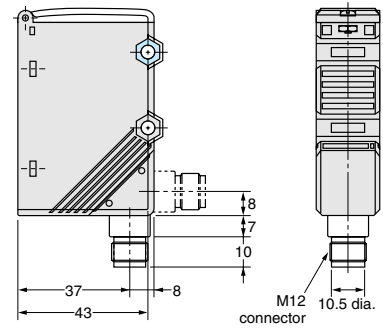
CAD file E3G_02

Connector type

E3G-R17-G



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

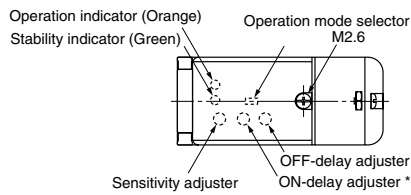
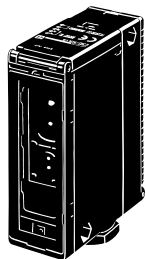


CAD file E3G_04

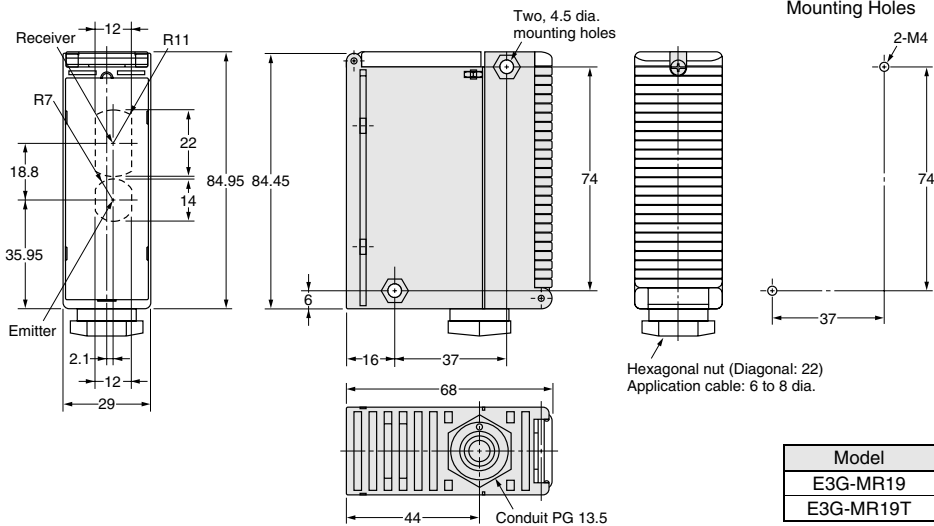
Terminal block

E3G-MR19-G

E3G-MR19T-G



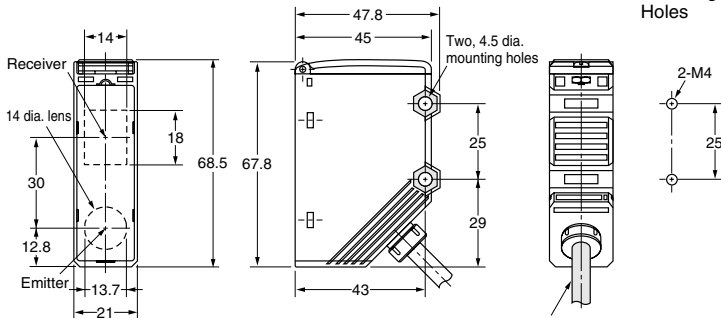
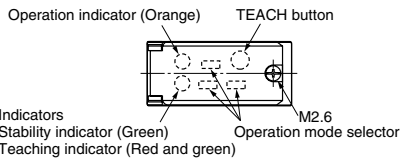
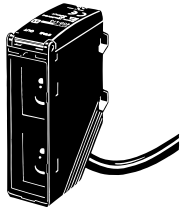
Note: * The ON or OFF-delay adjuster is not available with the E3G-MR19.



Model	CAD file
E3G-MR19	E3G_08
E3G-MR19T	E3G_07

Distance-setting

Pre-wired
E3G-L73

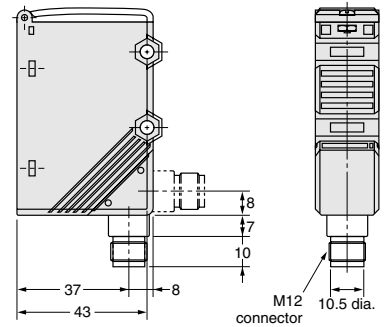


CAD file E3G_01

Connector type
E3G-L77

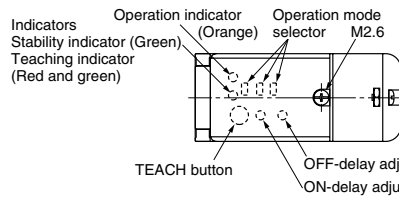


Note: The figures and dimensions not given are the same as those of E3G-L73-G shown on the left.

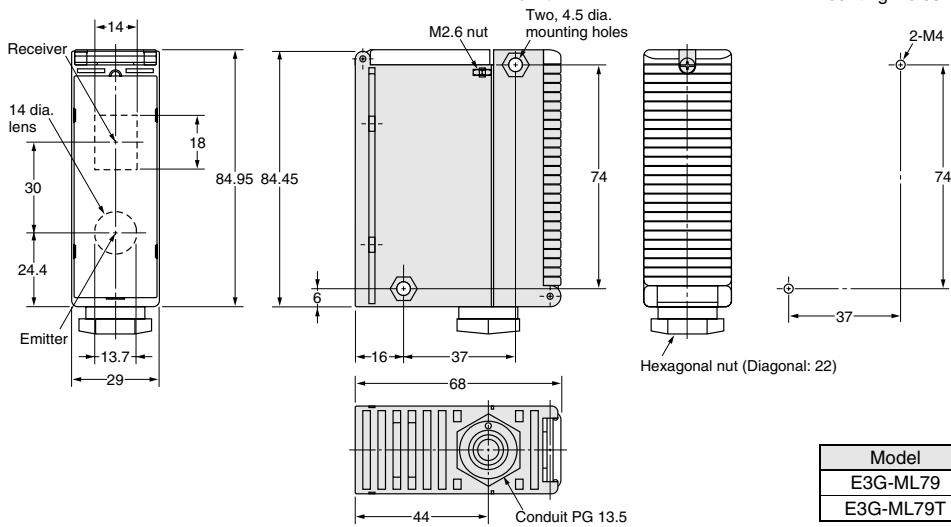


CAD file E3G_03

Terminal block
E3G-ML79-G
E3G-ML79T-G



E3G-ML79-G does not equipped ON-delay adjuster and OFF-delay adjuster.

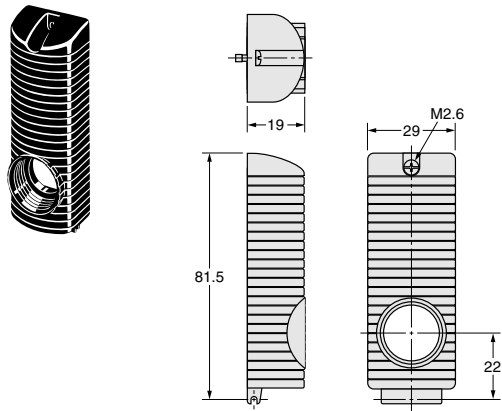


Model	CAD file
E3G-ML79	E3G_05
E3G-ML79T	E3G_06

Accessories (Order Separately)

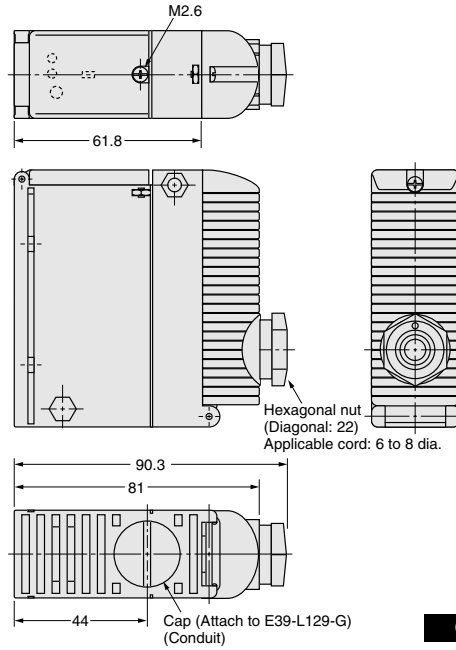
Terminal Protection Cover for Side-pullout Cable

E39-L129-G



Note: 1. The cover is provided with a rubber bushing and cap to prevent the cable from being pulled out in vertical direction.

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



CAD file E39_41

Reflectors and Mounting Brackets

A-314

E3G

Distance-setting Photoelectric Sensor

E3G-L1/L3

Sharply cuts all influences such as work glossiness, inclination and colors.



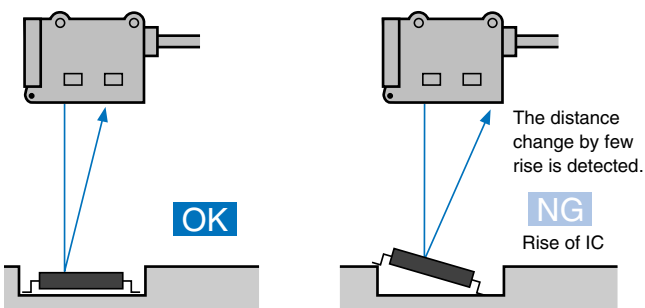
Features

1 mm dia. pin-point beam allows detection of minute objects (E3G-L1)

Smallest in the Industry

OMRON's unique Hyper LED achieves a pin-point light source only 1/7 the size of conventional light sources, with uniform light-intensity distribution. The Hyper LED achieves stable detection of small objects by eliminating non-detection of objects due to the drop-out which commonly occurs at the center of conventional LEDs.

The clearly visible spot makes it easy to check the optical axis adjustment and sensing position.



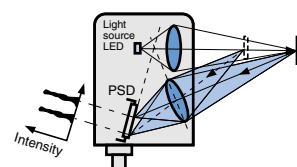
Stable detection is not limited to object color, but also on inclination and glossiness

First in the Industry

(Inclination characteristic of E3G-L1 is 2.6 times better than that of conventional models.)

The use of the shining object free optical system with the conventional triangulation measuring reduces the discrepancies in sensing distance due to object color, surface, and inclination. (E3G-L3: 2.2 times better than conventional model)

Shine-proof Optical System (E3G-L1/L3)



A low-error distance signal is assured because an image is formed on the position sensitive detectors (PSD), irrespective of the sensing distance. Detection is also stable with respect to the inclination of the object.

Conventional Distance-setting Model

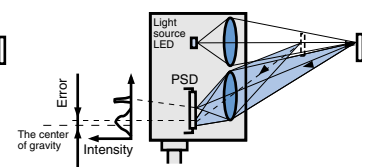
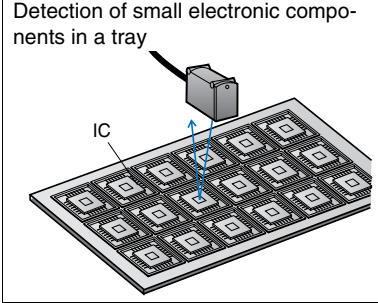
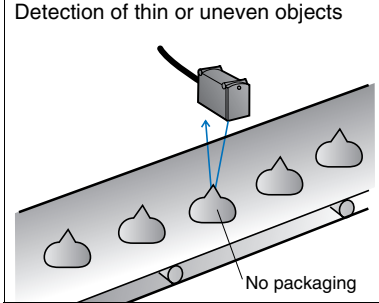
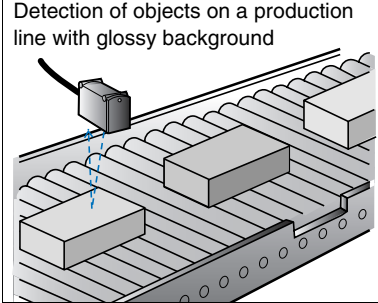
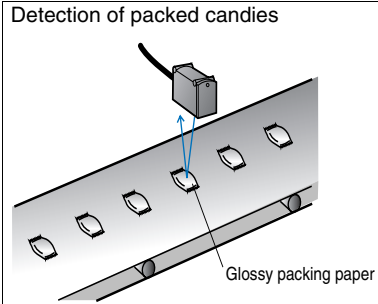
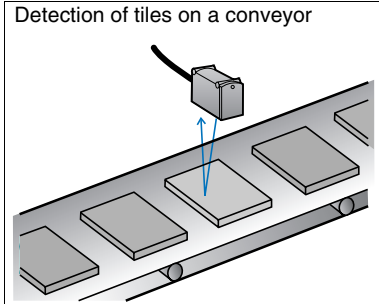
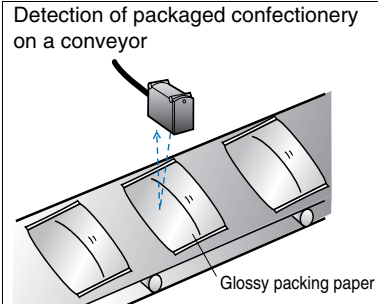


Image formation on the position sensitive detectors (PSD) is impossible at some sensing distances. The spot diameter is large, distance errors occur due to displacement of the object center of gravity, and detection is unstable with respect to inclination of the object.

Application

Meets the needs of all industries, including semiconductors, electronic components, food and packaging

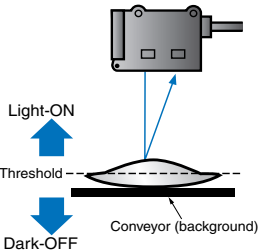
<p>Normal mode</p>		
<p>E3G-L1 (50 mm type)</p> <p>Detection of small electronic components in a tray</p> 	<p>Detection of thin or uneven objects</p> 	<p>E3G-L3 (200 mm type)</p> <p>Detection of objects on a production line with glossy background</p> 
<p>Zone mode</p>		
<p>E3G-L1 (50 mm type)</p> <p>Detection of packed candies</p> 	<p>Detection of tiles on a conveyor</p> 	<p>E3G-L3 (200 mm type)</p> <p>Detection of packaged confectionery on a conveyor</p> 

Features

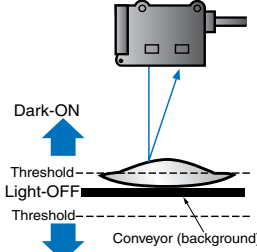
Simple Detection of Glossy, Uneven Objects

First in the Industry

Normal Mode ↔ Selectable ↔ Zone Mode



Light-ON
Threshold
Dark-OFF
Conveyor (background)



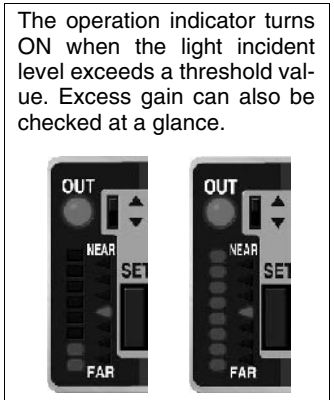
Dark-ON
Threshold
Light-OFF
Threshold
Dark-ON (with Dark-ON setting)
Conveyor (background)

As a triangulation measuring with 4% or less differential travel (E3G-L1) is used, objects behind the setting distance cannot be detected. At a setting distance of 30 mm, a step on objects with a thickness of 1.2 mm can be detected.

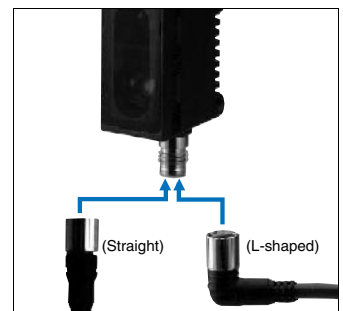
Glossy, uneven objects are reliably detected because the Light-OFF status occurs only when the conveyor is detected, and Dark-ON status when objects exist.

Optimal Background and Conveyor Teaching Double-bar Display Indicates Excess Gain at a Glance

Features one-touch teaching function settings. After the object, background, and conveyor or teaching are complete, fine adjustment of the sensitivity can be made in 13 levels in the Normal mode or in 5 levels in the Zone mode. It is simple to increase excess gain and set up the fine-step detection.



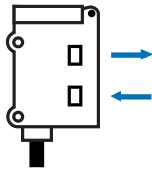
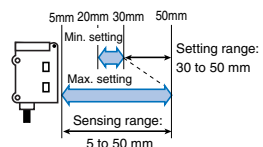
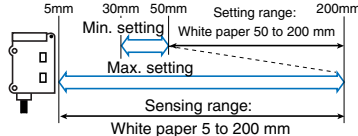
Line-up of M8 Connector Type
Easy to disconnect and maintain.



Ordering Information



Sensors

 Red light  Infrared light



Shape	Connection method	Sensing/Setting range	Operating mode	Model	
				NPN output	PNP output
	Pre-wired	 <p>5mm 20mm 30mm 50mm Min. setting Max. setting Setting range: 30 to 50 mm Sensing range: 5 to 50 mm</p>	Light-ON Dark-ON (selectable)	E3G-L11	E3G-L12
	Connector type			E3G-L15	E3G-L16
	Pre-wired	 <p>5mm 30mm 50mm 200mm Min. setting Max. setting Setting range: 200mm White paper 50 to 200 mm Sensing range: 5 to 200 mm White paper 5 to 200 mm</p>		E3G-L31	E3G-L32
	Connector type			E3G-L35	E3G-L36

Accessories

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L139	1	Provided with E3G-□□1/-L□2
	E39-L140	1	Provided with E3G-□□5/-L□6

Sensor I/O Connectors

Cable	Shape	Cable length		Model
Standard cable	Straight 	2 m	4 conductors	XS3F-M421-402-A
		5 m		XS3F-M421-405-A
	L-shaped 	2 m		XS3F-M422-402-A
		5 m		XS3F-M422-405-A

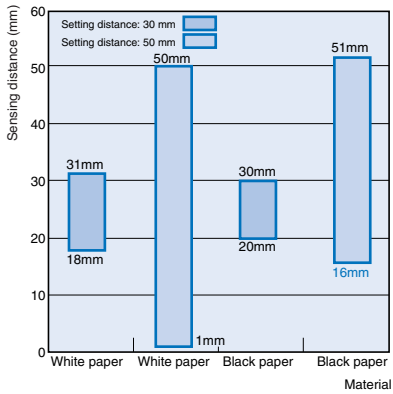
Rating/Performance

Item	Sensor type		Distance-setting			
	Model	NPN output	E3G-L11	E3G-L15	E3G-L31	E3G-L35
		PNP output	E3G-L12	E3G-L16	E3G-L32	E3G-L36
Sensing	5 to 50 mm (White paper 50 x 50 mm, Setting distance 50 mm)			5 to 200 mm (White paper 50 x 50 mm, Setting distance 200 mm) 5 to 150 mm (Black paper 50 x 50 mm, Setting distance 150 mm)		
Setting range	30 to 50 mm (White paper/Black paper 50 x 50 mm)			50 to 200 mm (White paper 50 x 50 mm) 50 to 150 mm (Black paper 50 x 50 mm)		
Differential distance	4% max. of sensing distance			10% of setting distance (typical)		
Reflectivity characteristics (black/white error)	4% max. of sensing distance			10% max. of setting distance (Setting distance 50 to 150 mm)		
Light source (wave length)	Red LED (660 nm)			Infrared LED (860 nm)		
Spot size	1 mm dia. max. (Sensing distance 38 mm)			15 mm dia. max. (Sensing distance 150 mm)		
Power supply voltage	10 to 30 VDC [ripple (p-p) 10% included]					
Current consumption	55 mA max.			65 mA max.		
Control output	Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage NPN type: 1.2 V max., PNP type: 2 V max.) Open collector output type (depends on the NPN/PNP output, format) Light-ON/Dark-ON switch selectable					
Protective circuits	Reverse polarity protection, output short-circuit protection, mutual interference prevention					
Response time	Operation or reset: 1.5 ms max.			Operation or reset: 2.5 ms max.		
Distance setting	Teaching method (NORMAL mode/ZONE mode)					
Fine distance adjustment	Manual threshold fine adjustment (NORMAL mode: 13 levels/ZONE mode: 5 levels)					
Indicator lamp	Operation indication (orange), distance indication (green, 8 levels), threshold indication (red, NORMAL mode: 13 levels/ZONE mode: 5 levels)					
Ambient illuminance	Incandescent lamp: 3,000 lux max. Sunlight: 10,000 lux max.					
Ambient temperature	Operating: -25°C to 55°C, Storage: -30°C to 70°C (with no icing or condensation)					
Ambient humidity	Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)					
Insulation resistance	20 M Ω min. at 500 VDC					
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute					
Vibration resistance	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 for 3 times each in X, Y, and Z directions					
Protective structure	IEC 60529 IP67 (with Protective Cover attached)					
Connection method	Pre-wired (standard length: 2 m)		M8 connector		Pre-wired (standard length: 2 m)	
Weight (Packed state)	Approx. 64 g		Approx. 21 g		Approx. 64 g	
Material	Case	PBT (polybutylene terephthalate)				
	Cover	Acrylics (PMMA)				
	Mounting Brackets	Stainless steel (SUS304)				
Accessories	Mounting bracket (with screws), instruction manual					

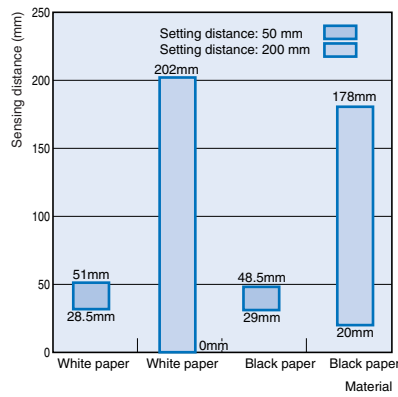
Characteristic data (typical)

Close-range Characteristics

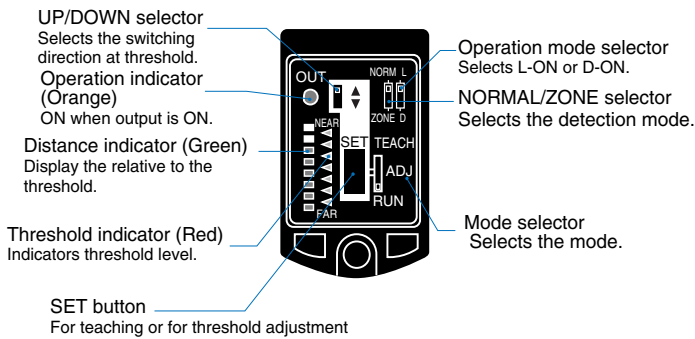
E3G-L1□



E3G-L3□



Part names and functions



Output Circuit Diagram

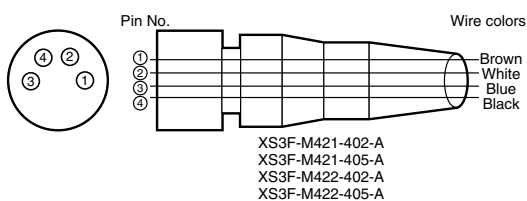
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3G-L11 E3G-L15 E3G-L31 E3G-L35	Light ON		L•ON (LIGHT ON)	<p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>
	Dark ON		D•ON (DARK ON)	<p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3G-L12 E3G-L16 E3G-L32 E3G-L36	Light ON		L•ON (LIGHT ON)	<p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>
	Dark ON		D•ON (DARK ON)	<p>Connector Pin Arrangement</p> <p>Note: Terminal 2 is not used.</p>

Connectors (Sensor I/O connectors)



Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	1	Power supply (+V)
	White	2	---
	Blue	3	Power supply (0 V)
	Black	4	Output

Note: Pin 2 is open.

Operation

Adjustment Steps

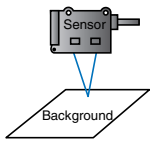
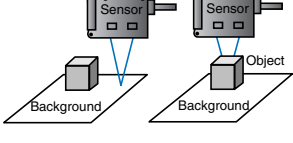

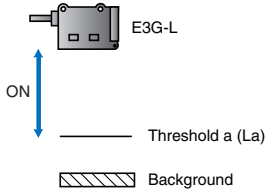
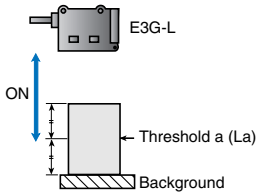
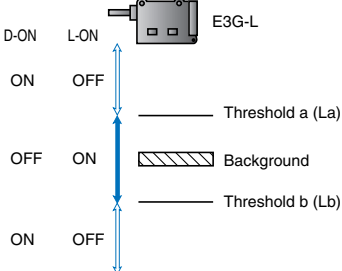
Procedure	Operation
1	Install, wire, and turn on the Sensor.
2	Perform distance setting (teaching). Refer to "Distance Setting (Teaching)".
3	Fine-adjust the threshold as necessary. Refer to "Manual Tuning (Fine Distance Adjustment)" on page A-189.
4	Check that the mode selector is set to RUN .

Distance Setting (Teaching)

Select the most appropriate teaching method in reference to the following descriptions.

Application	1	2	3
	<ul style="list-style-type: none"> Teaching without sensing objects (i.e. Teaching the background). 	<ul style="list-style-type: none"> Detection of slight differences in surface level. Setting a threshold in the middle between the background and sensing object for operation. 	<ul style="list-style-type: none"> Detection of glossy objects in front of the background.



Teaching	1	2	3
	Normal one-point teaching	Normal two-point teaching	Zone one-point teaching
Setting method	Press the TEACH button with the background object. 	Press the TEACH button with background object and with sensing object. 	Press the TEACH button with the background object (conveyor, etc.). 
Set threshold	Threshold (a) is set immediately in front of the background.	Threshold (a) is set approximately in the middle between the background and sensing object.	A pair of thresholds, (a) and (b), are set.
Output ON range	The output is ON between the Sensor and La. 	The output is ON between the Sensor and La. 	The output is ON between La and Lb. 

La: Distance equivalent to threshold (a) Lb: Distance equivalent to threshold (b)

● The following settings are also possible:

Setting the maximum sensing distance of the Sensor: Maximum distance setting.

Setting the minimum differential travel of the Sensor: Minimum distance setting.

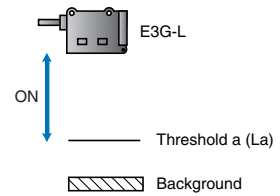
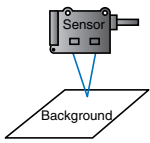
● Distance from sensor to background must be as shown below during normal one-point or zone one-point teaching.

Model	Distance from sensor to background
E3G-L1□	32 mm min.
E3G-L3□	55 mm min.

● Maximum sensing distance of E3G-L3 type may differ by color of the sensing object when setting distance is more than 150 mm.

Confirm the operation of the Sensor before actual operation.

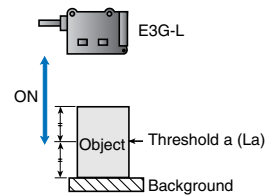
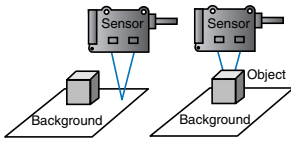
1 Normal one-point teaching



Proce-dure	Operation	Panel Status
1	Set the mode selector to TEACH .	
2	Set the NORMAL/ZONE mode selector to NORMAL .	
3	Press the SET button with the background. • All threshold indicators (red) are turned ON.	Panel status diagram showing the SET button being pressed (indicated by a blue arrow and the word "Press"). To the right, a vertical column of 10 red triangles (threshold indicators) is shown, all of which are lit.
4	Set the mode selector to RUN .	
5	Set to L-ON or D-ON mode with the operation mode selector. L-ON: Output ON between background and sensor. D-ON: Output OFF between background and sensor.	
Application Example 1		
1	Set the mode selector to TEACH .	
2	Set the NORMAL/ZONE mode selector to NORMAL .	
3	Set the UP/DOWN selector to down.	
4	Press the SET button for 3 s or more. • All threshold indicators (red) are turned ON.	Panel status diagram showing the SET button being pressed (indicated by a blue arrow and the word "Press"). To the right, a vertical column of 10 red triangles (threshold indicators) is shown, all of which are lit.
5	When all distance indicators (green) are then turned ON, the setting is complete. Set the mode selector to RUN .	Panel status diagram showing the SET button being pressed for 3 seconds (indicated by a blue arrow and the text "Press the SET button for 3 s or more."). To the right, a vertical column of 10 green triangles (distance indicators) is shown, all of which are lit.
6	Set L-ON/D-ON with the operation mode selector. (Refer to Normal one-point teaching)	Panel status diagram showing the mode selector set to RUN (indicated by a blue arrow and the text "Set the mode selector to RUN"). To the right, a vertical column of 10 green triangles (distance indicators) is shown, all of which are lit.
Application Example 2		
1	Set the mode selector to TEACH .	
2	Set the NORMAL/ZONE mode selector to NORMAL .	
3	Set the UP/DOWN selector to up.	
4	Press the SET button for 3 s or more. • All threshold indicators (red) are turned ON.	Panel status diagram showing the SET button being pressed for 3 seconds (indicated by a blue arrow and the text "Press the SET button for 3 s or more."). To the right, a vertical column of 10 red triangles (threshold indicators) is shown, all of which are lit.
5	When all distance indicators (green) are turned ON, the setting is complete. Set the mode selector to RUN .	Panel status diagram showing the SET button being pressed for 3 seconds (indicated by a blue arrow and the text "Press the SET button for 3 s or more."). To the right, a vertical column of 10 green triangles (distance indicators) is shown, all of which are lit.
6	Set L-ON/D-ON with the operation mode selector. (Refer to Normal one-point teaching)	Panel status diagram showing the mode selector set to RUN (indicated by a blue arrow and the text "Set the mode selector to RUN"). To the right, a vertical column of 10 green triangles (distance indicators) is shown, all of which are lit.

La: Distance equivalent to threshold (a)

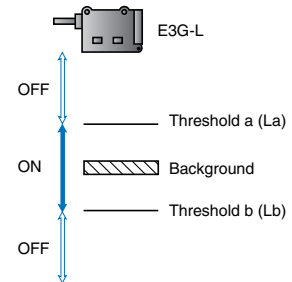
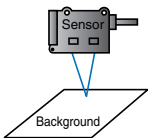
2 Normal two-point teaching



Proce-dure	Operation	Panel Status
1	Set the mode selector to TEACH .	<p>Object</p> <p>Threshold indicator (red) turns ON.</p> <p>Background</p> <p>Distance indicator (green) turns ON.</p> <p>Threshold indicator (red) starts to flash.</p>
2	Set the NORMAL/ZONE mode selector to NORMAL .	
3	Press the SET button with a sensing object located at sensing position. • All threshold indicators (red) are turned ON.	
4	Move the sensing object and press the SET button with the background. • If the teaching is successful, all distance indicators (green) are turned ON. • If the teaching is not successful, all threshold indicators (red) flicker.	
5	If the teaching is successful, set the mode selector to RUN to complete the teaching operation. If the teaching is not successful, change the position of the object and setting distance that have been set and repeat from the above step 3.	
6	Set to L-ON or D-ON mode with the operation mode selector.	

La: Distance equivalent to threshold (a)

3 Zone one-point teaching



Proce-dure	Operation	Panel Status
1	Set the mode selector to TEACH .	<p>Distance indicator (green) turns ON.</p> <p>Threshold indicator (red) starts to flash.</p>
2	Set the NORMAL/ZONE mode selector to ZONE .	
3	Press the SET button with the background. While the button is pressed, all threshold indicators (red) are turned ON. When the button is released: • If the teaching is successful, all distance indicators (green) are turned ON.	
4	Set the mode selector to RUN .	
5	Set to L-ON or D-ON mode with the operation mode selector. L-ON: Output ON between background and sensor. D-ON: Output OFF between background and sensor.	

La: Distance equivalent to threshold (a)

Precautions

Correct Use

Wiring Considerations

Cable

The bending radius should be 25 mm or more.

Avoiding Malfunctions

If using the photoelectric sensor with an inverter or servomotor, be sure to ground the FG (frame ground) and G (ground) terminals, otherwise the Sensor may malfunction.

Mounting

Mounting the Sensor

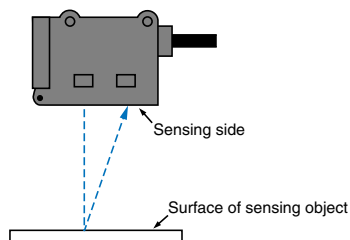
- If Sensors are mounted face-to-face, ensure that no optical axes cross each other. Otherwise, mutual interference may result.
- Be sure to install the Sensor carefully so that the directional angle range of the Sensor will not be directly exposed to intensive light, such as sunlight, fluorescent light, 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 lose its water-resistive properties.
- Use M3 screws to mount the Sensor.
- When mounting the case, make sure that the tightening torque applied to each screw does not exceed 0.54 Nm.

M8 Connector

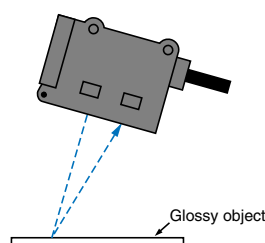
- Be sure to connect or disconnect the metal connector after turning OFF the Sensor.
- Hold the connector cover to connect or disconnect the metal connector.
- Secure the connector cover by hand. Do not use any pliers, otherwise the connector may be damaged.
- If the M8 connector is not connected securely, the M8 connector may be disconnected by vibration or the proper degree of protection of the Sensor may not be maintained.

Installation Directions

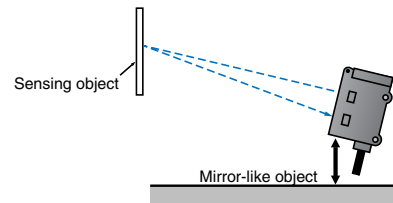
- Ensure that the sensing side of the Sensor is parallel to the surface of each sensing object. Do not incline the Sensor towards the sensing object.



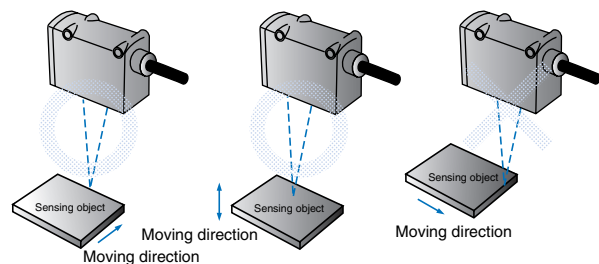
If the sensing object has a glossy surface, incline the Sensor by 5° to 10° as shown on the right, provided that the Sensor is not influenced by any background objects.



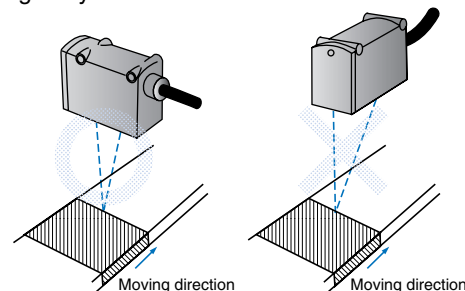
- If there is a mirror-like object below the Sensor, the Sensor may not be in stable operation. Therefore, incline the Sensor or keep the Sensor at a certain distance from the mirror-like object as shown below.



- Ensure 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.



● Adjustment

If the Sensor is not in stable operation due to color differences, perform a fine adjustment of the threshold level and confirm stable detection. Refer to "Manual Teaching (Fine Distance Setting).

● Maintenance and Inspection

Cleaning

Thinner or like damage the casing of the Sensor. Do not apply thinner to clean the Sensor.

Miscellaneous

EEPROM Writing Error

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.

Water Resistance

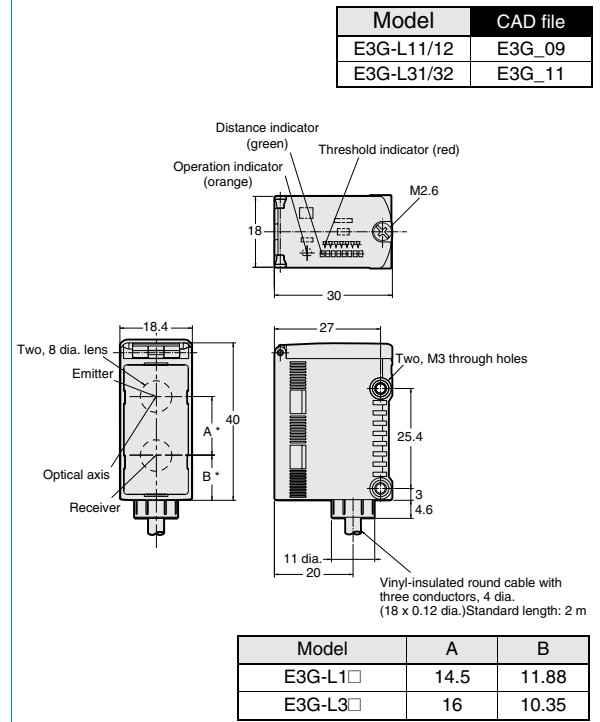
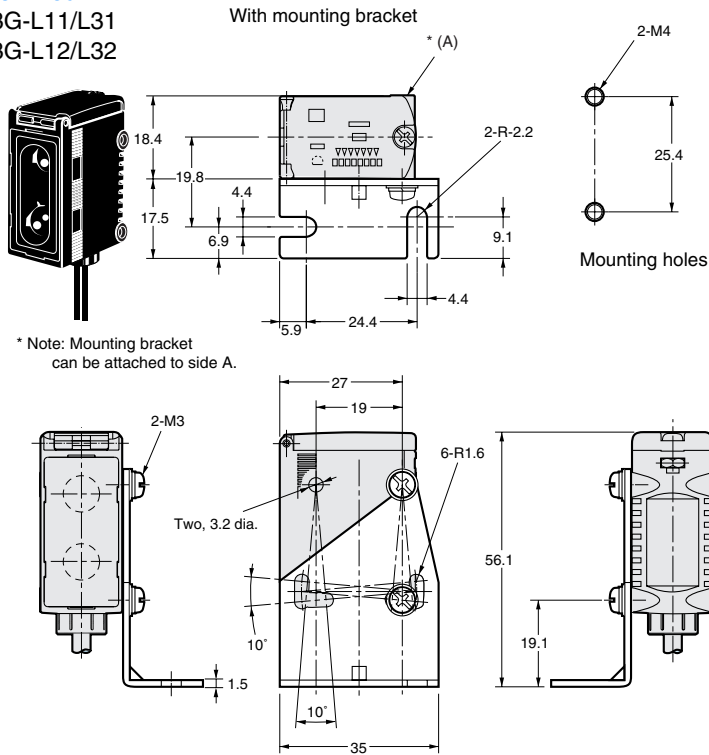
To ensure the water resistivity of the Sensor, tighten the screws of the operation panel cover to a torque of 0.2 to 0.3 Nm.

Dimensions (Unit: mm)

Sensors

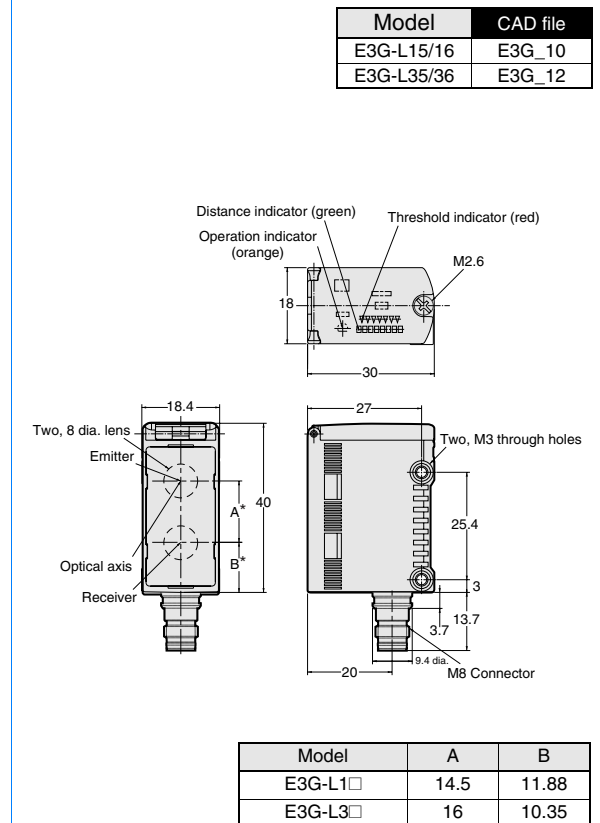
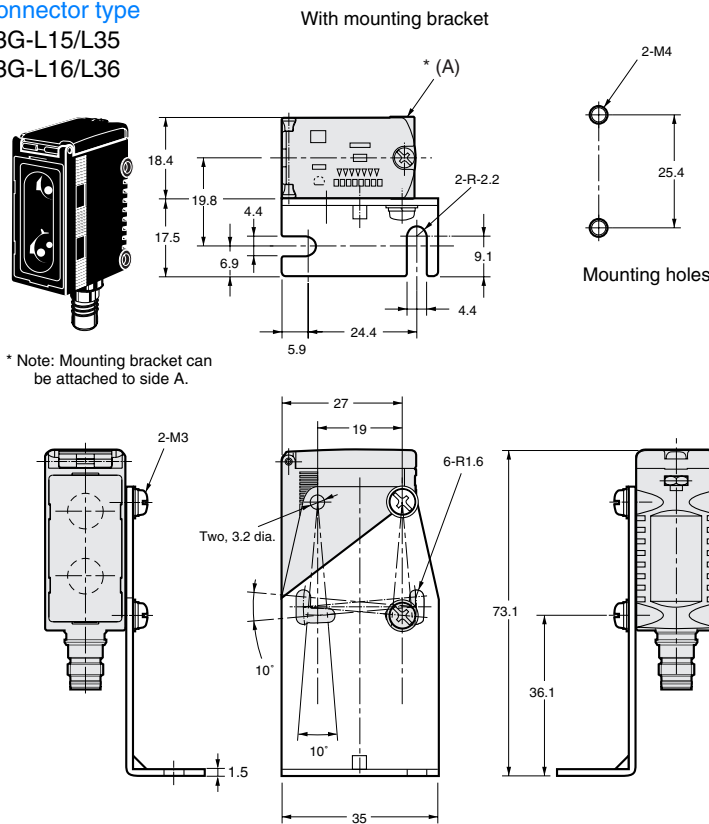
Pre-wired

E3G-L11/L31
E3G-L12/L32



Connector type

E3G-L15/L35
E3G-L16/L36



Accessories (Order Separately)

A-296

Distance setting photoelectric sensor (compact/plastic case)

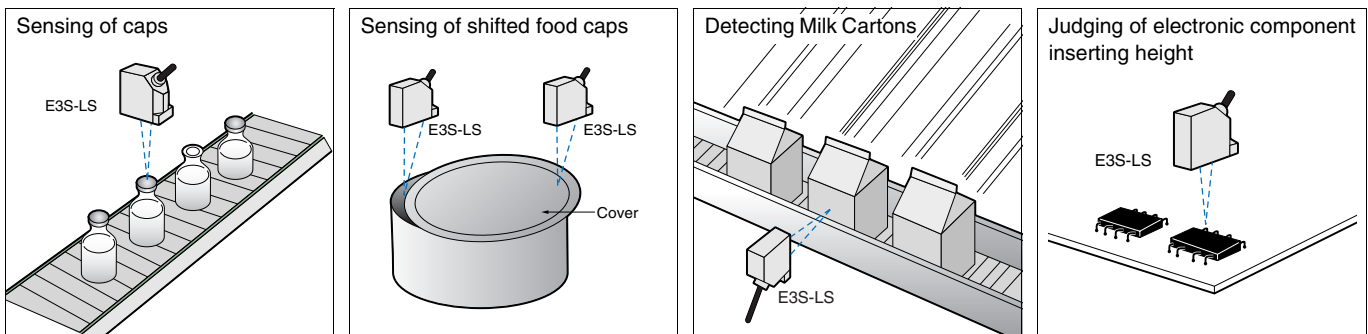
E3S-LS

*No complicated sensitivity adjustment required!
Just set the distance to ensure a stable detection of works of various colors.*

- Pinpoint focusable and area focusable models eliminate background objects.
- Compact body in plastic case.
- Satisfies IP67, resistant to water drops and dust.
- Small spot type is ideal for inspection of small objects.



Application Examples



Ordering Information

Shape	Sensing	Model	
		NPN output	PNP output
	<p>Min. setting 40mm Max. setting 60mm Sensing zone 5 to 60mm</p>	E3S-LS5C4S	E3S-LS5B4S1
	<p>Min. setting 40mm Max. setting 100mm Sensing zone 5 to 100mm</p>	E3S-LS10C4S	---
	<p>Min. setting 40mm Max. setting 200mm Sensing zone 0 to 200mm</p>	E3S-LS20C4S	E3S-LS20B4S1

Rating/Performance

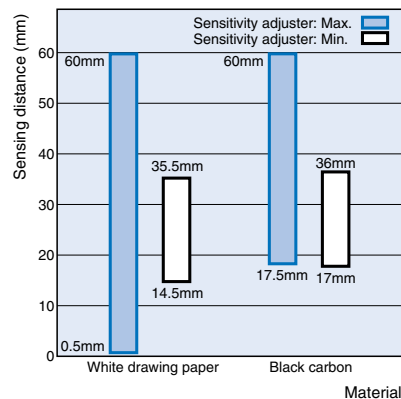
Item	Sensing method	Distance-setting		
	Model	E3S-LS5□4S(1)	E3S-LS10C4S	E3S-LS20□4S(1)
Sensing		5 to 60 mm (White paper 10 x 10 mm) (Setting distance 60 mm)	5 to 100 mm (White paper 25 x 25 mm) (Setting distance 100 mm)	200 mm (White paper 50 x 50 mm) (Setting distance 200 mm)
Setting range		40 to 60 mm (White paper 10 x 10 mm)	40 to 100 mm (White paper 25 x 25 mm)	40 to 200 mm (White paper 50 x 50 mm)
Differential distance		2 mm max.	3 mm max.	15% max.
Reflectivity characteristic (White paper 50 x 50 mm)*		10% max.		
Light source (wave length)		Red LED (700 nm)		Infrared LED (890nm)
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) : 10% max.		
Current consumption		35 mA max.		
Control output		Load supply voltage 24 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (depends on the NPN/PNP output format) Light-ON/Dark-ON switch selectable		
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention		
Response time		Operation or reset: 1 ms max.	Operation or reset: 5 ms max.	Operation or reset: 2 ms max.
Distance setting		2-turn adjuster		
Ambient illuminance		Incandescent lamp: 3,000 lux max.		
Ambient temperature		Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)		
Insulation resistance		20 M Ω min. at 500 VDC		
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min		
Vibration resistance		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 for 3 times each in X, Y, and Z directions		
Protective structure		IEC 60529 IP67		
Connection method		Pre-wired models (standard length: 2 m)		
Weight (Packed state)		Approx. 110 g		
Material	Case	Heat-resistant ABS resin		
	Lens	Polyarylate		
	Mounting Brackets	Stainless steel		
Accessories		Mounting bracket, cross-shaped recess/slotted head screw M3 x 12 (with spring washer, flat washer), adjusting screwdriver, "DON'T TOUCH (already adjusted)" seal, instruction manual		

* Sensing distance difference between standard white paper (reflectivity 90%) and standard black paper (reflectivity 5%)

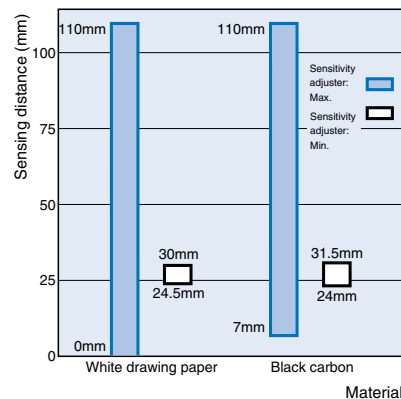
Characteristic data (typical)

Short-distance characteristic chart

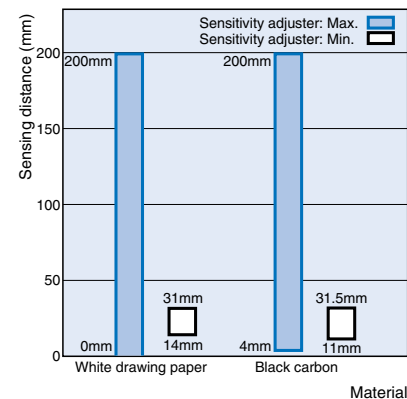
E3S-LS5□4S(1)



E3S-LS10C4S



E3S-LS20□4S(1)



Output Circuit Diagram

NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-LS□C4S	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-LS□B4S1	Light ON		L•ON (LIGHT ON)	
	Dark ON		D•ON (DARK ON)	

Note: For the self-diagnostic output timing chart, refer to "Self-diagnostic Output and Stability Display" on the next page.

Precautions

E3S-LS

Correct Use

Design

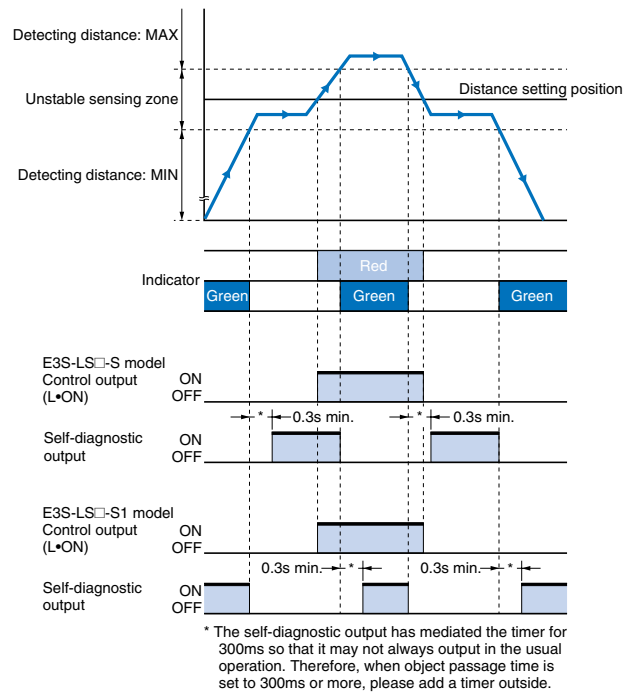
Self-diagnostic Output and Stability Display

E3S-LS□S

The self-diagnostic output turns ON when the sensing object is placed in the instability detection area.

E3S-LS□S1

The self-diagnostic output turns ON when the sensing object is placed in the stability detection area.



Self-diagnostic function

The self-diagnostic function is designed to self-diagnose margins for environmental changes after installation, especially for an ambient temperature change, and gives them with the indicators and outputs. NEAR indicates the status that the object is nearer than the setting distance, and Far the status that the object is farther than the setting distance.

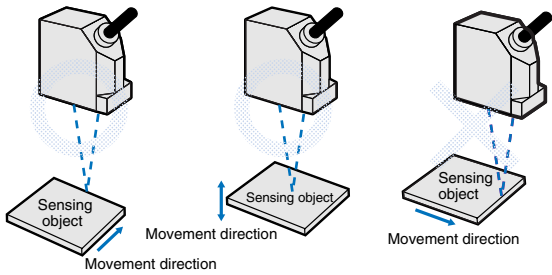
The E3S-LS5/LS10/LS20 detects an object in the NEAR status.

Area	Display status	NEAR/FAR status indicated by the red indicator	Margin for temperature change indicated by green indicator	Self-diagnostic output type		Example of diagnosis condition
				E3S-LS20C4S E3S-LS10C4S E3S-LS5C4S	E3S-LS20B4S1 E3S-LS5B4S1	
Stability NEAR		Light Red indicator (: ON)	For a stable use in the entire temperature range given as the rating. (Green indicator: ON)	Self-diagnostic output OFF	Self-diagnostic output ON	---
Instability NEAR				Self-diagnostic output ON	Self-diagnostic output OFF	
Instability FAR		Dark Red indicator (: OFF)	For a stable use if a temperature change is within ±10°C of the temperature at the time of installation. (Green indicator : OFF)	Self-diagnostic output ON	Self-diagnostic output OFF	---
Stability FAR				Self-diagnostic output OFF	Self-diagnostic output ON	

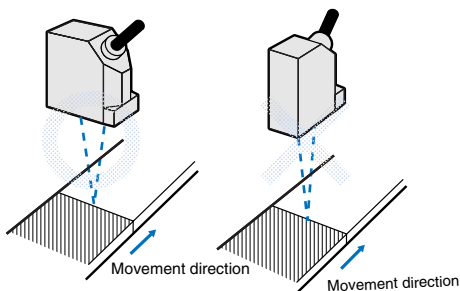
Mounting

Mounting the Sensor

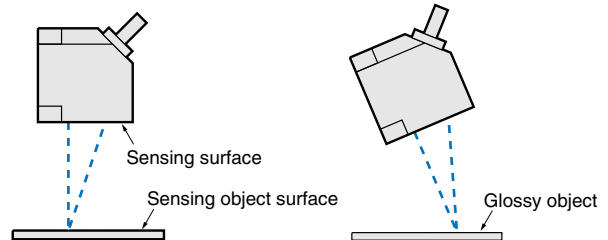
- The tightening torque for case installation should be within 0.49 Nm.
- Note the installation angle so that the sun, fluorescent lamp, incandescent lamp or any other strong light will not enter the directional angle range of the sensor (receiver).
- For the sensor mounting orientation and detecting object entering direction, note the mounting orientation of the photoelectric sensor relative to the moving direction of the detecting object.



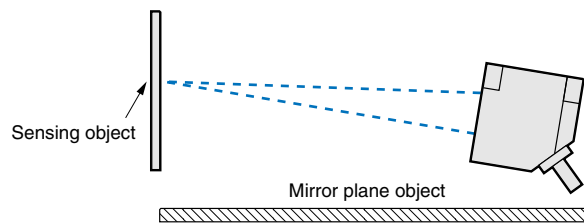
Also, if the color/material of the sensing object is subject to extreme variations, install the photoelectric sensor in either of the following orientations.



- Mount the photoelectric sensor so that its detection surface and the object surface are always parallel (without inclination relative to 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.

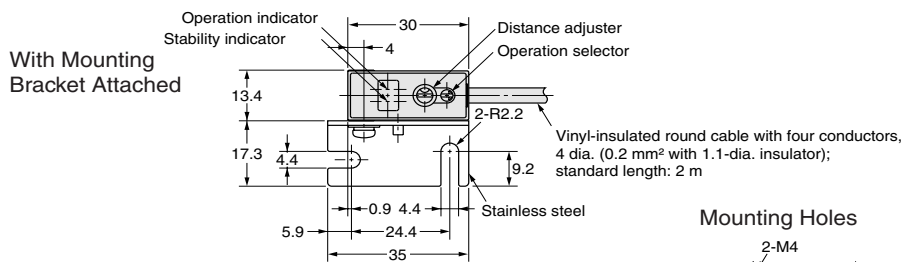
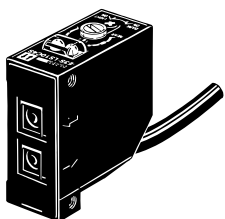


- If there is a mirror-smooth object under the photoelectric sensor, operation may become unstable. Therefore, incline the photoelectric sensor as shown below or move it away from the object.

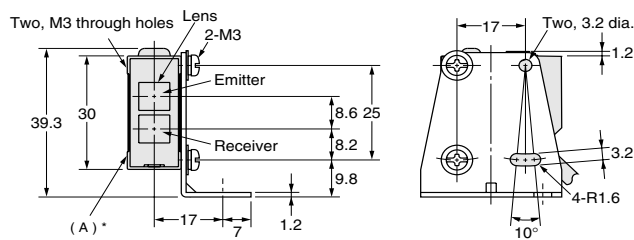
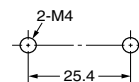


Dimensions (Unit: mm)

E3S-LS□□4S(1)



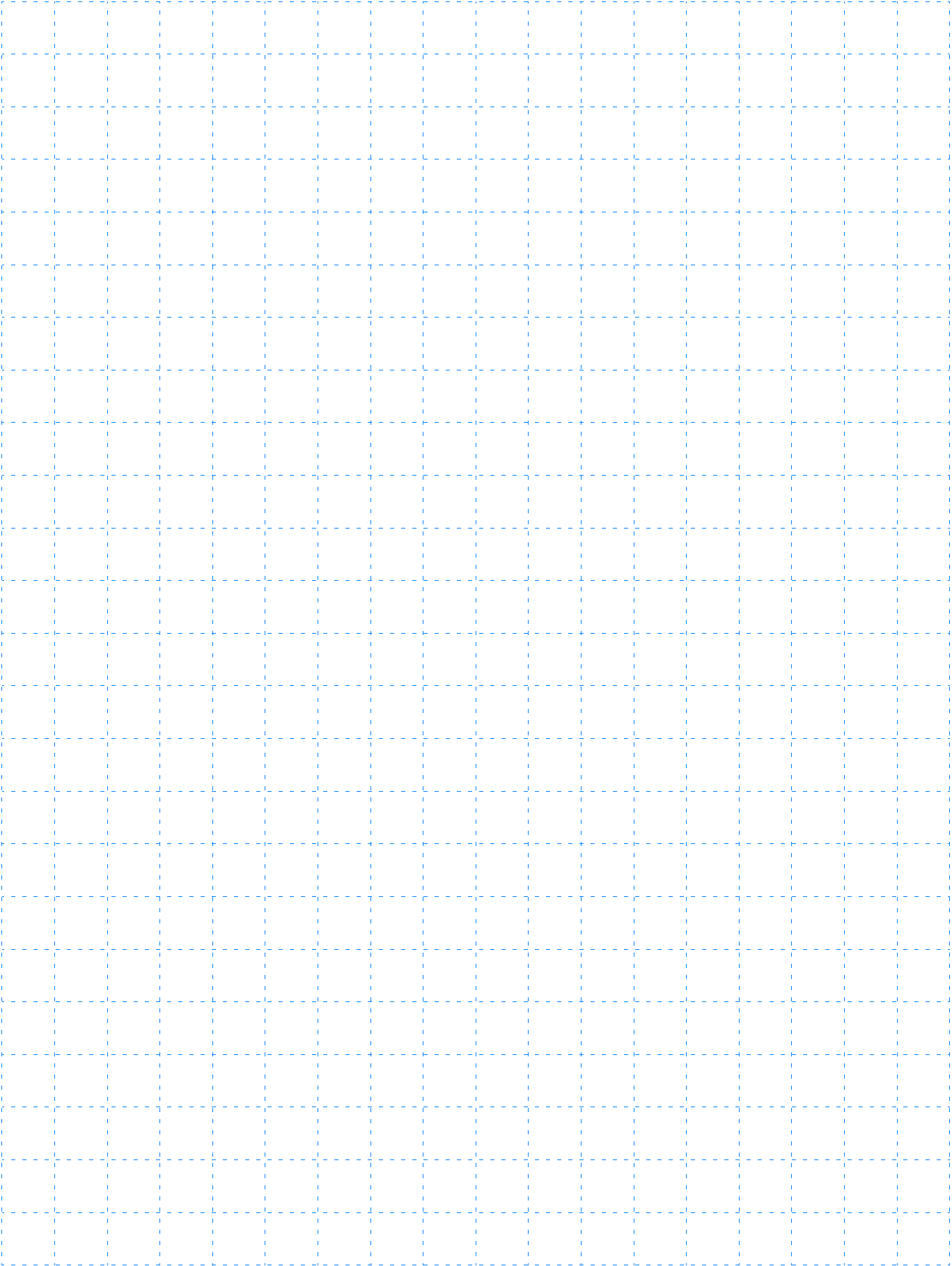
Mounting Holes



* The Mounting Bracket can also be used on side A.

Model	CAD file
E3S-LS20B4S1	E3S_16
E3S-LS20C4S	
E3S-LS5B4S1	
E3S-LS5C4S	E3S_17
E3S-LS10C4S	

MEMO



E3S-LS

Photoelectric sensor






E3F2*Threaded Cylindrical Photoelectric Sensors with Built-in Amplifier for Use as an Optical Proximity Switch***Features**

- M18 DIN-sized cylindrical housing
- Housing materials: plastic, nickel plated brass and stainless steel
- Axial and radial types (with integrated 90°-optics)
- Improved enclosure ratings (IP67)
- DC switching types with connectors for easy maintenance
- Full metal plug-in type
- Sensing distance separate type : 7 m
- Retroreflective polarized type (MSR): 2 m
- Long detection distance (30 cm) with sensitivity adjuster for diffuse type
- Wide-beam characteristics (10 cm) for diffuse type
- Wide operating voltage range (10 to 30 VDC or 24 to 240 VAC)
- Short-circuit and reverse connection protection (DC switching type)
- UL and CSA approved (AC switching types)
- UL listed (DC switching types)

Selection Guide






DC-Switching Models

Housing Material: Plastic

Sensing method		Appearance	Connection method	Sensing distance	Model				
					PNP output	NPN output			
Through-beam		 axial	pre-wired M12 connector	7 m	E3F2-7B4 E3F2-7B4-P1	E3F2-7C4 E3F2-7C4-P1			
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)	 axial	pre-wired M12 connector		0.1 - 2 m (with reflector E39-R1)	E3F2-R2B4 E3F2-R2B4-P1	E3F2-R2C4 E3F2-R2C4-P1		
	Polarizing (with MSR function)		pre-wired M12 connector	-		-			
	Non-polarizing (without MSR function)	 radial	pre-wired M12 connector	-		-			
	Polarizing (with MSR function)		pre-wired M12 connector	E3F2-R2RB4 E3F2-R2RB4-P1		E3F2-R2RC4 E3F2-R2RC4-P1			
	Diffuse reflective		 axial	pre-wired M12 connector		0.1 m	E3F2-DS10B4-N E3F2-DS10B4-P1	E3F2-DS10C4-N E3F2-DS10C4-P1	
	Fixed sensing distance Wide-beam characteristics			pre-wired M12 connector			0.3 m	E3F2-DS30B4 E3F2-DS30B4-P1	E3F2-DS30C4 E3F2-DS30C4-P1
Adjustable sensing distance	 radial	pre-wired M12 connector		0.1 m	-	-			
Fixed sensing distance Wide-beam characteristics		pre-wired M12 connector			0.3 m	E3F2-DS30B4 E3F2-DS30B4-P1	E3F2-DS30C4 E3F2-DS30C4-P1		
Adjustable sensing distance		pre-wired M12 connector	-	-					
Adjustable sensing distance		pre-wired M12 connector	E3F2-DS30B4 E3F2-DS30B4-P1	E3F2-DS30C4 E3F2-DS30C4-P1					








Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4 2M or E3F2-R2RB4 5M). For other cable length please contact your OMRON sales representative.

Housing material: Metal (Nickel plated brass)

Sensing method		Appearance	Connection method	Sensing distance	Model				
					PNP output	NPN output			
Through-beam		 axial	pre-wired M12 connector	7 m	E3F2-7B4-M E3F2-7B4-M1-M	E3F2-7C4-M E3F2-7C4-M1-M			
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)	 axial	pre-wired M12 connector		0.1 - 2 m (with reflector E39-R1)	-	-		
	Polarizing (with MSR function)		pre-wired M12 connector	E3F2-R2RB4-M E3F2-R2RB4-M1-M		E3F2-R2RC4-M E3F2-R2RC4-M1-M			
	Non-polarizing (without MSR function)	 radial	pre-wired M12 connector	-		-			
	Polarizing (with MSR function)		pre-wired M12 connector	E3F2-R2RB41-M E3F2-R2RB41-M1-M		E3F2-R2RC41-M E3F2-R2RC41-M1-M			
	Diffuse reflective		 axial	pre-wired M12 connector		0.1 m	E3F2-DS10B4-M E3F2-DS10B4-M1-M	E3F2-DS10C4-M E3F2-DS10C4-M1-M	
	Fixed sensing distance Wide-beam characteristics			pre-wired M12 connector			0.3 m	E3F2-DS30B4-M E3F2-DS30B4-M1-M	E3F2-DS30C4-M E3F2-DS30C4-M1-M
Adjustable sensing distance	 radial	pre-wired M12 connector		0.1 m	-	-			
Fixed sensing distance Wide-beam characteristics		pre-wired M12 connector			0.3 m	E3F2-DS30B41-M E3F2-DS30B41-M1-M	E3F2-DS30C41-M E3F2-DS30C41-M1-M		
Adjustable sensing distance		pre-wired M12 connector	-	-					
Adjustable sensing distance		pre-wired M12 connector	E3F2-DS30B41-M E3F2-DS30B41-M1-M	E3F2-DS30C41-M E3F2-DS30C41-M1-M					

Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4-M 2M or E3F2-R2RB4-M 5M). For other cable length please contact your OMRON sales representative.




Housing material: Metal (Stainless steel)

Sensing method		Appearance	Connection method	Sensing distance	Model	
					PNP output	NPN output
Through-beam			pre-wired M12 connector	7 m	E3F2-7B4-S E3F2-7B4-M1-S	E3F2-7C4-S E3F2-7C4-M1-S
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)		pre-wired	0.1 - 2 m (with reflector E39-R1)	–	–
	Polarizing (with MSR function)		M12 connector		–	–
	Non-polarizing (without MSR function)		pre-wired		E3F2-R2RB4-S	E3F2-R2RC4-S
	Polarizing (with MSR function)		M12 connector		E3F2-R2RB4-M1-S	E3F2-R2RC4-M1-S
Diffuse reflective	Fixed sensing distance Wide-beam characteristics		pre-wired	0.1 m	E3F2-DS10B4-S	E3F2-DS10C4-S
			M12 connector		E3F2-DS10B4-M1-S	E3F2-DS10C4-M1-S
	Adjustable sensing distance		pre-wired	0.3 m	E3F2-DS30B4-S	E3F2-DS30C4-S
			M12 connector		E3F2-DS30B4-M1-S	E3F2-DS30C4-M1-S
	Fixed sensing distance Wide-beam characteristics		pre-wired	0.1 m	–	–
			M12 connector		–	–
	Adjustable sensing distance		pre-wired	0.3 m	–	–
			M12 connector		–	–

Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB4-S 2M or E3F2-R2RB4-S 5M). For other cable length please contact your OMRON sales representative.

AC-Switching Models

Housing material: Plastic

Sensing method		Appearance	Connection method	Sensing distance	Model	
					Light-ON	Dark-ON
Through-beam			pre-wired	3 m	E3F2-3Z1	E3F2-3Z2
Retro-reflective (incl. reflector E39-R1)	Non-polarizing (without MSR function)		pre-wired	0.1 - 2 m (with reflector E39-R1)	E3F2-R2Z1	E3F2-R2Z2
Diffuse reflective	Fixed sensing distance Wide-beam characteristics		pre-wired	0.1 m	E3F2-DS10Z1-N	E3F2-DS10Z2-N

Note: Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2Z1 2M or E3F2-R2Z1 5M). For other cable length please contact your OMRON sales representative.





Accessories (Order Separately)

Name	Sensing distance (typical) [1.]	Model	Remark
Reflectors	0.1 - 3.7 m (axial) 0.1 - 2.4 m (radial)	E39-R1	60 x 40 mm (included in some models)
	0.1 - 4.2 m (axial) 0.1 - 2.7 m (radial)	E39-R7	∅ 84 mm
	0.1 - 5.3 m (axial) 0.1 - 3.1 m (radial)	E39-R8	100 x 100 mm
		E39-RSA E39-RSB E39-RS3	35 x 10 mm 35 x 40 mm 80 x 70 mm
Lens Cap		E39-F31	
Mounting Bracket		Y92E-B18	

For detailed information about Accessories, refer to the main chapter "Accessories" at the end of the document.

Note: 1 .Typical sensing distance corresponds to 80 % of the max. sensing distance. For details, please refer to "Engineering Data".

Sensor I/O Connectors

Cord	Shape	Cable type	Model
Standard	Straight 	2 m	XS2F-D421-D80-A
		5 m	XS2F-D421-G80-A
	L-shaped 	2 m	XS2F-D422-D80-A
		5 m	XS2F-D422-G80-A
Vibration-proof robot cable	Straight 	2 m	XS2F-D421-D80-R
		5 m	XS2F-D421-G80-R
	L-shaped 	2 m	XS2F-D422-D80-R
		5 m	XS2F-D422-G80-R

E3F2

Ordering Information: type list

DC-Switching Models, plastic

Model	Sensing method, sensing distance	Appearance	Connection (cable-length)	Control output	Comments
E3F2-7B4 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver and Emitter
E3F2-7B4-P1	Through-beam, 7 m	axial	Connector	PNP	Receiver and Emitter
E3F2-7C4 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver and Emitter
E3F2-7C4-P1	Through-beam, 7 m	axial	Connector	NPN	Receiver and Emitter
E3F2-7DB4 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver only
E3F2-7DB4-P1	Through-beam, 7 m	axial	Connector	PNP	Receiver only
E3F2-7DC4 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver only
E3F2-7DC4-P1	Through-beam, 7 m	axial	Connector	NPN	Receiver only
E3F2-7L 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	N.A.	Emitter only
E3F2-7L -P1	Through-beam, 7 m	axial	Connector	N.A.	Emitter only
E3F2-DS10B4-N 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	PNP	Wide-beam characteristic
E3F2-DS10B4-P1	Diffuse reflective, 0.1 m	axial	Connector	PNP	Wide-beam characteristic
E3F2-DS10C4-N 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	NPN	Wide-beam characteristic
E3F2-DS10C4-P1	Diffuse reflective, 0.1 m	axial	Connector	NPN	Wide-beam characteristic
E3F2-DS30B4 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30B41 2M	Diffuse reflective, 0.3 m	radial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30B41-P1	Diffuse reflective, 0.3 m	radial	Connector	PNP	Sensitivity adjuster
E3F2-DS30B4-P1	Diffuse reflective, 0.3 m	axial	Connector	PNP	Sensitivity adjuster
E3F2-DS30C4 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-DS30C41 2M	Diffuse reflective, 0.3 m	radial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-DS30C41-P1	Diffuse reflective, 0.3 m	radial	Connector	NPN	Sensitivity adjuster
E3F2-DS30C4-P1	Diffuse reflective, 0.3 m	axial	Connector	NPN	Sensitivity adjuster
E3F2-R2B4 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Non-polarizing
E3F2-R2B4-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Non-polarizing, without reflector
E3F2-R2B4-P1	Retroreflective, 2 m	axial	Connector	PNP	Non-polarizing
E3F2-R2B4-P1-E	Retroreflective, 2 m	axial	Connector	PNP	Non-polarizing, without reflector
E3F2-R2C4 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Non-polarizing
E3F2-R2C4-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Non-polarizing, without reflector
E3F2-R2C4-P1	Retroreflective, 2 m	axial	Connector	NPN	Non-polarizing
E3F2-R2C4-P1-E	Retroreflective, 2 m	axial	Connector	NPN	Non-polarizing, without reflector
E3F2-R2RB41 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	PNP	Polarizing
E3F2-R2RB41-E 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	PNP	Polarizing, without reflector
E3F2-R2RB41-P1	Retroreflective, 2 m	radial	Connector	PNP	Polarizing
E3F2-R2RB41-P1-E	Retroreflective, 2 m	radial	Connector	PNP	Polarizing, without reflector
E3F2-R2RC41 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	NPN	Polarizing
E3F2-R2RC41-E 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	NPN	Polarizing, without reflector
E3F2-R2RC41-P1	Retroreflective, 2 m	radial	Connector	NPN	Polarizing
E3F2-R2RC41-P1-E	Retroreflective, 2 m	radial	Connector	NPN	Polarizing, without reflector

* Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB41 2M or E3F2-R2RB41 5M). For other cable length please contact your OMRON sales representative.

DC-Switching Models, metal (nickel plated brass)

Model	Sensing method, sensing range	Appearance	Connection (cable-length)	Control output	Comments
E3F2-7B4-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver and Emitter
E3F2-7B4-M1-M	Through-beam, 7 m	axial	Connector	PNP	Receiver and Emitter
E3F2-7C4-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver and Emitter
E3F2-7C4-M1-M	Through-beam, 7 m	axial	Connector	NPN	Receiver and Emitter
E3F2-7DB4-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver only
E3F2-7DB4-M1-M	Through-beam, 7 m	axial	Connector	PNP	Receiver only
E3F2-7DC4-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver only
E3F2-7DC4-M1-M	Through-beam, 7 m	axial	Connector	NPN	Receiver only
E3F2-7L-M 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	N.A	Emitter only
E3F2-7L-M1-M	Through-beam, 7 m	axial	Connector	N.A	Emitter only
E3F2-DS10B4-M 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	PNP	Wide-beam characteristic
E3F2-DS10B4-M1-M	Diffuse reflective, 0.1 m	axial	Connector	PNP	Wide-beam characteristic
E3F2-DS10C4-M 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	NPN	Wide-beam characteristic
E3F2-DS10C4-M1-M	Diffuse reflective, 0.1 m	axial	Connector	NPN	Wide-beam characteristic
E3F2-DS30B41-M 2M	Diffuse reflective, 0.3 m	radial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30B41-M1-M	Diffuse reflective, 0.3 m	radial	Connector	PNP	Sensitivity adjuster
E3F2-DS30B4-M 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30B4-M1-M	Diffuse reflective, 0.3 m	axial	Connector	PNP	Sensitivity adjuster
E3F2-DS30C41-M 2M	Diffuse reflective, 0.3 m	radial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-DS30C41-M1-M	Diffuse reflective, 0.3 m	radial	Connector	NPN	Sensitivity adjuster
E3F2-DS30C4-M 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-DS30C4-M1-M	Diffuse reflective, 0.3 m	axial	Connector	NPN	Sensitivity adjuster
E3F2-R2RB41-M 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	PNP	Polarizing
E3F2-R2RB41-M1-M	Retroreflective, 2 m	radial	Connector	PNP	Polarizing
E3F2-R2RB41-M1-M-E	Retroreflective, 2 m	radial	Connector	PNP	Polarizing, without reflector
E3F2-R2RB41-M-E 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	PNP	Polarizing, without reflector
E3F2-R2RB4-M 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Polarizing
E3F2-R2RB4-M1-M	Retroreflective, 2 m	axial	Connector	PNP	Polarizing
E3F2-R2RB4-M1-M-E	Retroreflective, 2 m	axial	Connector	PNP	Polarizing, without reflector
E3F2-R2RB4-M-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Polarizing, without reflector
E3F2-R2RC41-M 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	NPN	Polarizing
E3F2-R2RC41-M1-M	Retroreflective, 2 m	radial	Connector	NPN	Polarizing
E3F2-R2RC41-M1-M-E	Retroreflective, 2 m	radial	Connector	NPN	Polarizing, without reflector
E3F2-R2RC41-M-E 2M	Retroreflective, 2 m	radial	Pre-wired (2 m)*	NPN	Polarizing, without reflector
E3F2-R2RC4-M 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Polarizing
E3F2-R2RC4-M1-M	Retroreflective, 2 m	axial	Connector	NPN	Polarizing
E3F2-R2RC4-M1-M-E	Retroreflective, 2 m	axial	Connector	NPN	Polarizing, without reflector
E3F2-R2RC4-M-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Polarizing, without reflector

* Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB41-M 2M or E3F2-R2RB41-M 5M). For other cable length please contact your OMRON sales representative.

DC-Switching Models, metal (stainless steel)

Model	Sensing method, sensing range	Appearance	Connection (cable-length)	Control output	Comments
E3F2-7B4-M1-S	Through-beam, 7 m	axial	Connector	PNP	Receiver and Emitter
E3F2-7B4-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver and Emitter
E3F2-7C4-M1-S	Through-beam, 7 m	axial	Connector	NPN	Receiver and Emitter
E3F2-7C4-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver and Emitter
E3F2-7DB4-M1-S	Through-beam, 7 m	axial	Connector	PNP	Receiver only
E3F2-7DB4-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	PNP	Receiver only
E3F2-7DC4-M1-S	Through-beam, 7 m	axial	Connector	NPN	Receiver only
E3F2-7DC4-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	NPN	Receiver only
E3F2-7L-M1-S	Through-beam, 7 m	axial	Connector	N.A.	Emitter only
E3F2-7L-S 2M	Through-beam, 7 m	axial	Pre-wired (2 m)*	N.A.	Emitter only
E3F2-DS10B4-M1-S	Diffuse reflective, 0.1 m	axial	Connector	PNP	Wide-beam characteristic
E3F2-DS10B4-S 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	PNP	Wide-beam characteristic
E3F2-DS10C4-M1-S	Diffuse reflective, 0.1 m	axial	Connector	NPN	Wide-beam characteristic
E3F2-DS10C4-S 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	NPN	Wide-beam characteristic
E3F2-DS30B4-M1-S	Diffuse reflective, 0.3 m	axial	Connector	PNP	Sensitivity adjuster
E3F2-DS30B4-S 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	PNP	Sensitivity adjuster
E3F2-DS30C4-M1-S	Diffuse reflective, 0.3 m	axial	Connector	NPN	Sensitivity adjuster
E3F2-DS30C4-S 2M	Diffuse reflective, 0.3 m	axial	Pre-wired (2 m)*	NPN	Sensitivity adjuster
E3F2-R2RB4-M1-S	Retroreflective, 2 m	axial	Connector	PNP	Polarizing
E3F2-R2RB4-M1-S-E	Retroreflective, 2 m	axial	Connector	PNP	Polarizing, without reflector
E3F2-R2RB4-S 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Polarizing
E3F2-R2RB4-S-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	PNP	Polarizing, without reflector
E3F2-R2RC4-M1-S	Retroreflective, 2 m	axial	Connector	NPN	Polarizing
E3F2-R2RC4-M1-S-E	Retroreflective, 2 m	axial	Connector	NPN	Polarizing, without reflector
E3F2-R2RC4-S 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Polarizing
E3F2-R2RC4-S-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	NPN	Polarizing, without reflector

* Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2RB41-S 2M or E3F2-R2RB41-S 5M). For other cable length please contact your OMRON sales representative.

AC-Switching Models, plastic

Model	Sensing method, sensing range	Appearance	Connection (cable-length)	Control output	Comments
E3F2-3LZ 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	N.A.	Emitter only
E3F2-3DZ1 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	Light-ON	Receiver only
E3F2-3DZ2 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	Dark-ON	Receiver only
E3F2-3Z1 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	Light-ON	Receiver and Emitter
E3F2-3Z2 2M	Through-beam, 3 m	axial	Pre-wired (2 m)*	Dark-ON	Receiver and Emitter
E3F2-R2Z1 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	Light-ON	Non-polarizing
E3F2-R2Z2 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	Dark-ON	Non-polarizing
E3F2-R2Z1-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	Light-ON	Non-polarizing, without reflector
E3F2-R2Z2-E 2M	Retroreflective, 2 m	axial	Pre-wired (2 m)*	Dark-ON	Non-polarizing, without reflector
E3F2-DS10Z1-N 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	Light-ON	Wide-beam characteristic
E3F2-DS10Z2-N 2M	Diffuse reflective, 0.1 m	axial	Pre-wired (2 m)*	Dark-ON	Wide-beam characteristic

* Standard cable length is 2 m. Models provided with a 5 m long cable are available. When ordering, specify the cable length by adding the length of the cable (e.g. E3F2-R2Z1 2M or E3F2-R2Z1 5M). For other cable length please contact your OMRON sales representative.

Specifications

Ratings / Characteristics of DC Switching Models

Item	E3F2-7B4-□ E3F2-7C4-□	E3F2-R2B4-□ E3F2-R2C4-□	E3F2-R2RB4-□ E3F2-R2RC4-□ E3F2-R2RB41-□ E3F2-R2RC41-□	E3F2-DS10B4-□ E3F2-DS10C4-□	E3F2-DS30B4-□ E3F2-DS30C4-□ E3F2-DS30B41-□ E3F2-DS30C41-□
Sensing method	Through-beam	Retroreflective		Diffuse reflective	
		non-polarizing (without MSR function)	polarizing (with MSR function)	wide-beam characteristic	adjustable sensing distance
Power supply voltage	10 to 30 V DC				
Current consumption	45 mA max.	25 mA max.	30 mA max.	25 mA max.	30 mA max.
Rated sensing distance [1.]	7m	0.1 - 2 m (with reflector E39-R1)	0.1 - 2 m (with reflector E39-R1)	0.1 m (5 x 5 cm white mat paper)	0.3 m (10 x 10 cm white mat paper)
Typical sensing distance for different reflector types (ref. to accessories) [2.]	–	E39-R1:4.0 m E39-R7:4.5 m E39-R8:5.3 m	E39-R1: axial 3.7 m radial 2.4 m E39-R7: axial 4.2 m radial 2.7 m E39-R8: axial 5.3 m radial 3.1 m	–	–
Standard object	Opaque: 11 mm dia. min.	Opaque: 56 mm dia. min.		–	
Directional angle	3° to 20°	3° to 20°	3° to 20°	–	
Differential travel (hysteresis)	–			20% max.	
Response time	Operation and Reset: 2.5 ms max.				
Control output	Transistor (open collector), load current: 100 mA max. (residual voltage: 2 V max.)				
Power reset time	50 ms				
Ambient illumination	Incandescent lamp: 3000 lx max. Sunlight: 10000 lx max.				
Ambient temperature	Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation)				
Ambient humidity	Operating: 35% to 85% / Storage: 35% to 95% (without condensation)				
Insulation resistance	20 MΩ min. at 500 V DC between energized parts and case				
Dielectric strength	1000 VAC max. , 50 / 60 Hz for 1 min between energized parts and case				
Vibration resistance	10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z)				
Shock resistance	Destruction: 500 m/s ² each direction (X, Y, Z)				
Enclosure ratings	IP67 [3.]; NEMA 1, 2, 4				
Light source	Infrared LED (880 nm)		Red LED (660 nm)	Infrared LED (880 nm)	
Indicators	Light incident / power indicator for light source (red)				
Sensitivity adjustment	Fixed				Adjustable
Connection method	2 m, 5 m pre-wired cable (PVC, dia. 4 mm (18 / 0.12) [4.]) or M12-connector				
Operation mode	Light-ON or Dark-ON selectable by wiring				
Weight (approx.)					
Plastic case	pre-wired (2 m)	120 g		60 g	
	connector	40 g		20 g	
Metal case	pre-wired (2 m)	180 g		90 g	
	connector	120 g		50 g	
Circuit protection	Output short-circuit and power supply reverse polarity				
Housing materials	Plastic	Plastic	Plastic (only radial type)	Plastic	Plastic
	Nickel brass	–	Nickel brass	Nickel brass	Nickel brass
	Stainless steel [5.]	–	Stainless steel [5.]	Stainless steel [5.]	Stainless steel [5.]

Note: 1. For stable sensing distance in detail, please refer to "Engineering Data"
 2. Typical sensing distance corresponds to 80 % of the max. sensing distance.
 3. The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter "Precautions")
 4. For other cable materials (e.g. PUR) please contact your OMRON sales representative.
 5. Material-specification for stainless steel housing case: 1.4305 (W.-No.), 303 (AISI), 2346 (SS). For other stainless steel materials please contact your OMRON sales representative.

Ratings / Characteristics of AC Switching Models

Item	E3F2-3Z1 E3F2-3Z2	E3F2-R2Z1 E3F2-R2Z2	E3F2-DS10Z1 E3F2-DS10Z2
Sensing method	Through-beam	Non-polarizing Retroreflective	Diffuse reflective (wide-beam characteristic)
Power supply voltage	24 to 240 VAC \pm 10 %, 50 / 60 Hz		
Current consumption	10 mA max.	5 mA max.	
Rated sensing distance[1.]	3 m	0.1 - 2 m (with reflector E39-R1)	0.1 m (5 x 5 cm white mat paper)
Typical sensing distance for different reflector types [2.]	–	E39-R1: 3,4 m E39-R7: 3,9 m E39-R8: 5,2 m	–
Detectable object	Opaque object: 11 mm min.	Opaque object: 56 mm min.	Opaque objects
Directional angle	3° to 20°		–
Differential travel	–		20 % max.
Response time	30 ms max.		
Control output	AC solid state (SCR) 200 mA max.; residual voltage: 5 V max. at 200 mA		
Power reset time	100 ms		
Ambient illumination	Incandescent lamp: 3000 lx max. Sunlight: 10000 lx max.		
Ambient temperature [5.]	Operating: -25 to 55 °C / Storage: -30 to 70 °C (with no icing or condensation)		
Ambient humidity	Operating: 35% to 85% / Storage: 35% to 95% (without condensation)		
Insulation resistance	20 M Ω min. at 500 V DC between energized parts and case		
Dielectric strength	1500 VAC, 50 / 60 Hz for 1 min between energized parts and case		
Vibration resistance	10 to 55 Hz, 1.5 mm double amplitude for 2 hrs each direction (X, Y, Z)		
Shock resistance	500 m/sqr (approx. 50 g) for each direction (X, Y, Z)		
Enclosure rating	IP67 [3.]; NEMA 1, 2, 4		
Light source	Infrared LED (880 nm)		
Indicators	Light incident/power indicator for light source (red)		
Sensitivity adjustment	Fixed		
Connection method	2 m, 5 m pre-wired cable (PVC dia. 4 mm (14 / 0.15) [4.]		
Operation mode	Light-ON or Dark-ON (fixed)		
Circuit protection	None		
Weight (approx.)	110 g (pre-wired 2 m cable)		
Housing materials	Case: ABS, lens: Acrylate resin		

Note: 1 . For stable sensing distance in detail, please refer to "Engineering Data"

2 . Typical sensing distance corresponds to 80 % of the max. sensing distance.

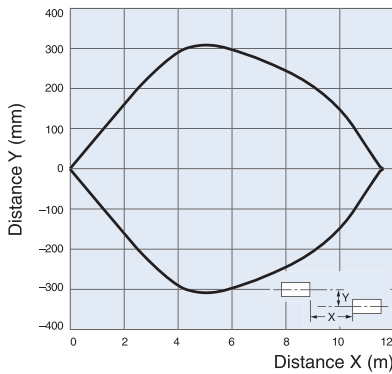
3 . The enclosure rating IP67 of OMRON internal standards correspond to stricter test requirements than the standard IEC 60529 (refer to chapter "Precautions")

4 . For other cable materials (e.g. PUR) please contact your OMRON sales representative.

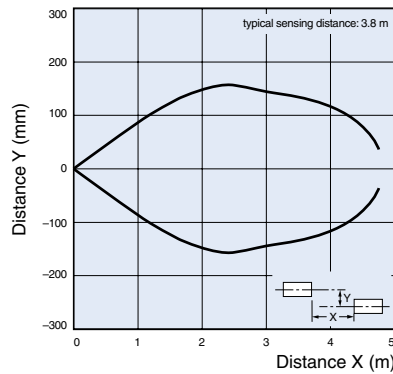
Engineering Data (Typical)

Operating Range (typical)

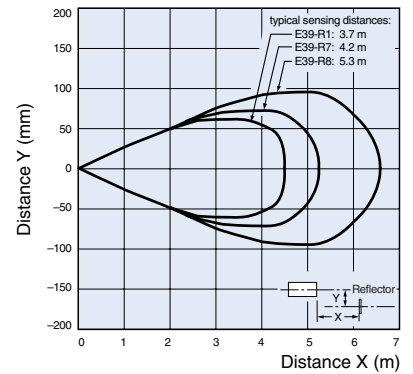
Through-beam Models (axial)
E3F2-7□4-□



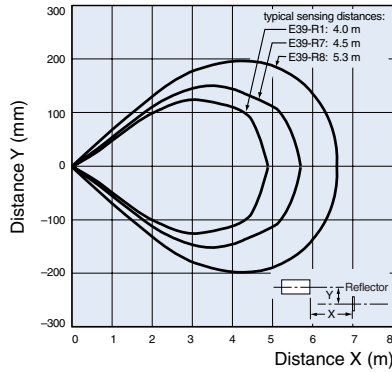
Through-beam Models (axial)
E3F2-3Z□



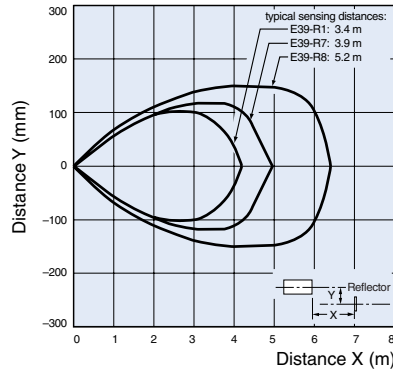
Retroreflective Models (axial)
E3F2-R2R□4-□ (polarizing)
and reflectors



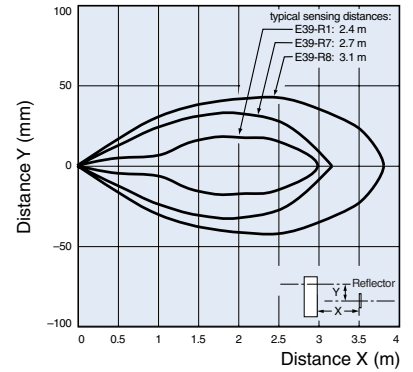
Retroreflective Models (axial)
E3F2-R2□4-□ (non polarizing)
and reflectors



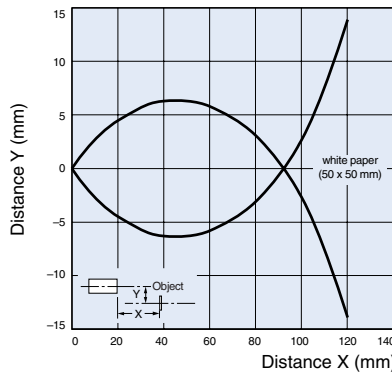
Retroreflective Models (axial)
E3F2-R2Z□ (non polarizing)
and reflectors



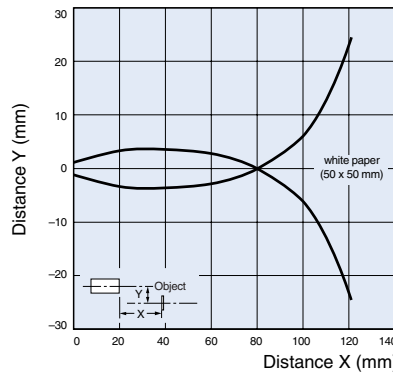
Retroreflective Models (radial)
E3F2-R2R□41-□ (polarizing)
and reflectors



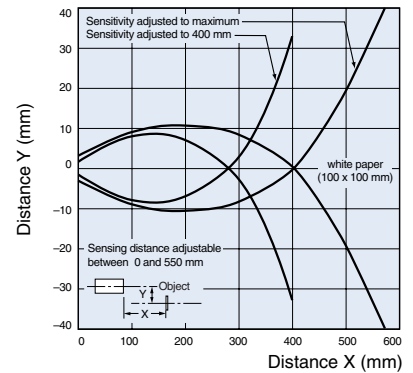
Diffuse reflective Models (axial)
E3F2-DS10□4-□ (wide-beam type)



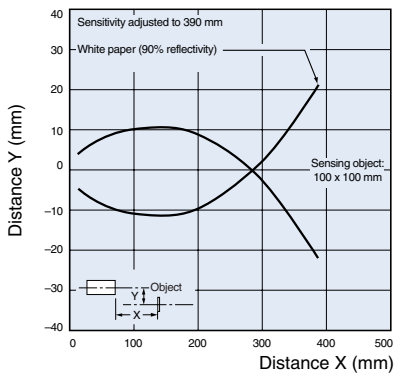
Diffuse reflective Models (axial)
E3F2-DS10Z-□ (wide-beam type)



Diffuse reflective Models (axial)
E3F2-DS30□4-□

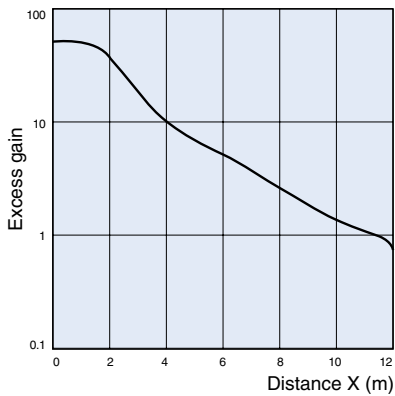


Diffuse reflective Models (radial)
E3F2-DS30□41-□

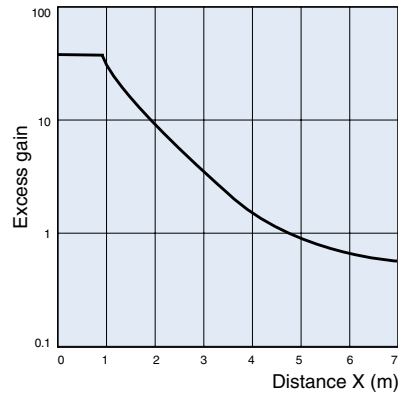


Excess Gain Ratio vs. Distance (typical)

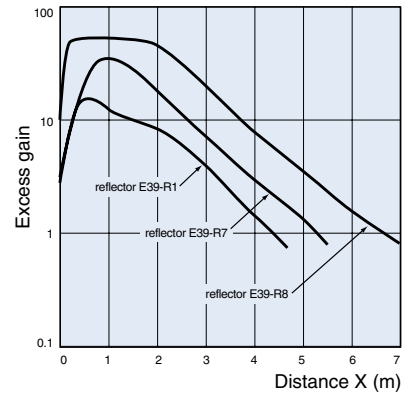
Through-beam Models (axial)
E3F2-7□4-□



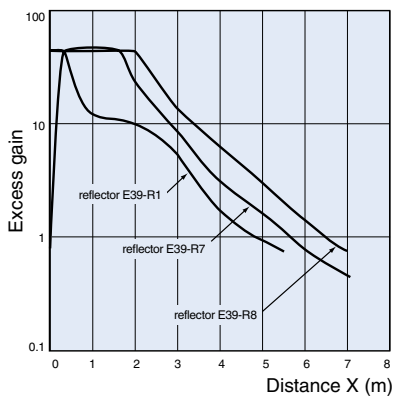
Through-beam Models (axial)
E3F2-3Z□



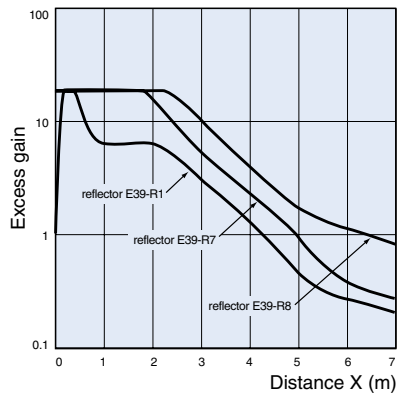
Retroreflective Models (axial)
E3F2-R2R□4-□ (polarizing)
and reflectors



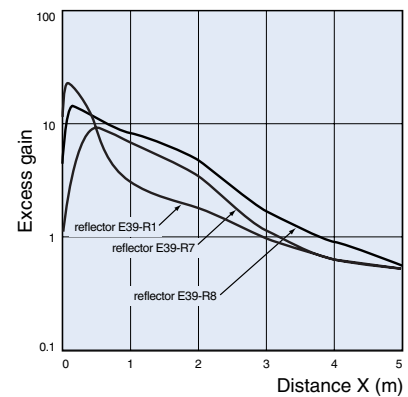
Retroreflective Models (axial)
E3F2-R2□4-□ (non polarizing)
and reflectors



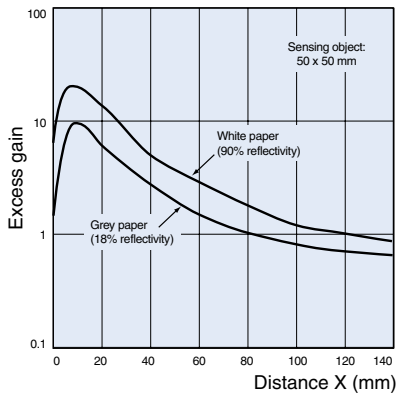
Retroreflective Models (axial)
E3F2-R2Z□ (non polarizing)
and reflectors



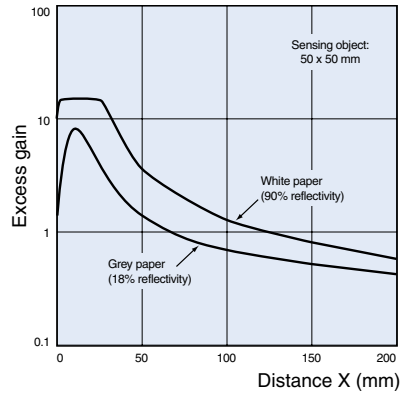
Retroreflective Models (radial)
E3F2-R2R□41-□ (polarizing)
and reflectors



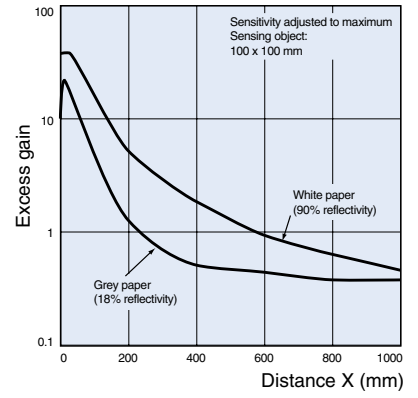
Diffuse reflective Models (axial)
E3F2-DS10□4□ (wide-beam type)



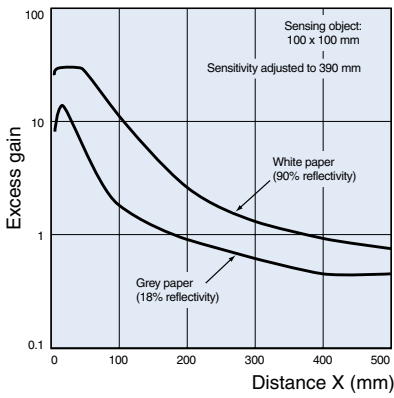
Diffuse reflective Models (axial)
E3F2-DS10Z□ (wide-beam type)



Diffuse reflective Models (axial)
E3F2-DS30□4□



Diffuse reflective Models (radial)
E3F2-DS30□41□

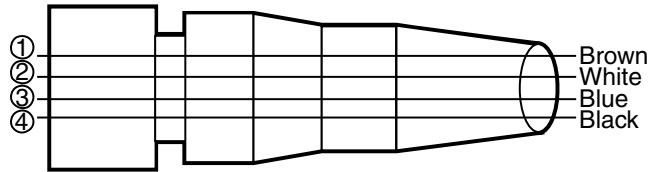


Operation

Output Circuits

Structure of Sensor I/O Connector

Classification	Wire color	Connector pin No.	Use
DC	Brown	①	Power supply (+V)
	White	②	Modeselection Lon/Don
	Blue	③	Power supply (0 V)
	Black	④	Output



XS2F-D42□-D80-□
XS2F-G42□-G80-□

PNP Output

Model	Output transistor status	Timing chart	Connection method	Output circuit
E3F2-7B4 E3F2-7B4-M E3F2-7B4-M1-M E3F2-7B4-M1-S E3F2-7B4-P1 E3F2-7B4-S E3F2-DS10B4-M E3F2-DS10B4-M1-M E3F2-DS10B4-M1-S E3F2-DS10B4-N E3F2-DS10B4-P1 E3F2-DS10B4-S E3F2-DS30B4 E3F2-DS30B41 E3F2-DS30B41-M E3F2-DS30B41-M1-M E3F2-DS30B41-P1 E3F2-DS30B4-M E3F2-DS30B4-M1-M E3F2-DS30B4-M1-S E3F2-DS30B4-P1 E3F2-DS30B4-S E3F2-R2B4 E3F2-R2B4-P1 E3F2-R2RB41 E3F2-R2RB41-M E3F2-R2RB41-M1-M E3F2-R2RB41-P1 E3F2-R2RB4-M E3F2-R2RB4-M1-M E3F2-R2RB4-M1-S E3F2-R2RB4-S	-	-	-	Through-beam emitter
	ON when light is incident. (Light-ON)		Connect the pink (Pin ②) and brown (Pin ①) cords or open the pink cord (Pin ②).	
	ON when light is interrupted. (Dark-ON)		Connect the pink and blue cords.	

Note: Terminal numbers for connector type.

NPN Output

E3F2

Model	Output transistor status	Timing chart	Connection method	Output circuit
E3F2-7C4 E3F2-7C4-M E3F2-7C4-M1-M E3F2-7C4-M1-S E3F2-7C4-P1 E3F2-7C4-S E3F2-DS10C4-M E3F2-DS10C4-M1-M E3F2-DS10C4-M1-S E3F2-DS10C4-N E3F2-DS10C4-P1 E3F2-DS10C4-S	-	-	-	<p>Through-beam emitter</p> <p>Connector Pin Arrangement</p>
E3F2-DS30C4 E3F2-DS30C41 E3F2-DS30C41-M E3F2-DS30C41-M1-M E3F2-DS30C41-P1 E3F2-DS30C4-M E3F2-DS30C4-M1-M E3F2-DS30C4-M1-S E3F2-DS30C4-P1 E3F2-DS30C4-S	ON when light is incident. (Light-ON)		Connect the pink (Pin ②) and brown (Pin ①) cords or open the pink cord (Pin ②).	<p>Connector Pin Arrangement</p>
E3F2-R2C4 E3F2-R2C4-P1 E3F2-R2RC41 E3F2-R2RC41-M E3F2-R2RC41-M1-M E3F2-R2RC41-P1 E3F2-R2RC4-M E3F2-R2RC4-M1-M E3F2-R2RC4-M1-S E3F2-R2RC4-S	ON when light is interrupted. (Dark-ON)		Connect the pink and blue cords.	<p>Connector Pin Arrangement</p>

Note: Terminal numbers for connector type.

AC Output

Model	Output transistor status	Timing chart	Connection method	Output circuit
E3F2-3LZ	-	-	-	<p>Through-beam emitter</p>
E3F2-3Z1 E3F2-R2Z1 E3F2-DS10Z1-N	ON when light is incident. (Light-ON)		-	
E3F2-3Z2 E3F2-R2Z2 E3F2-DS10Z2-N	ON when light is interrupted. (Dark-ON)		-	

Dimensions Note: All units are in millimeters unless otherwise indicated

DC-Switching Models, plastic, axial type

Cable type	Connector type
Without potentiometer	
<p>E3F2-7L E3F2-7D□4 E3F2-R2□4 E3F2-DS10□4-N</p>	<p>E3F2-7L-P1 E3F2-7D□4 -P1 E3F2-R2□4-P1 E3F2-DS10□4-P1</p>
With potentiometer	
<p>E3F2-DS30□4</p>	<p>E3F2-DS30□4-P1</p>

DC-Switching Models, plastic, radial type

E3F2

Cable type	Connector type
<p>Without potentiometer</p> <p>E3F2-R2R□41</p>	<p>E3F2-R2R□41-P1</p>
<p>With potentiometer</p> <p>E3F2-DS30□41</p>	<p>E3F2-DS30□41-P1</p>

DC-Switching Models, metal (brass and stainless steel), axial type

Cable type		Connector type	
Without potentiometer			
<p>E3F2-7L-M E3F2-7L-S E3F2-7D□4-M E3F2-7D□4-S E3F2-R2R□4-M E3F2-R2R□4-S E3F2-DS10□4-M E3F2-DS10□4-S</p>	<p>E3F2-7L-M1-M E3F2-7L-M1-S E3F2-7D□4-M1-M E3F2-7D□4-M1-S E3F2-R2R□4-M1-M E3F2-R2R□4-M1-S E3F2-DS10□4-M1-M E3F2-DS10□4-M1-S</p>		
With potentiometer			
<p>E3F2-DS30□4-M E3F2-DS30□4-S</p>	<p>E3F2-DS30□4-M1-M E3F2-DS30□4-M1-S</p>		

DC-Switching Models, metal (brass and stainless steel), radial type

Cable type		Connector type	
Without potentiometer			
E3F2-R2R□41-M	E3F2-R2R□41-S	E3F2-R2R□41-M1	E3F2-R2R□41-M1-S
With potentiometer			
E3F2-DS30□41-M	E3F2-DS30□41-S	E3F2-DS30□41-M1-M	E3F2-DS30□41-M1-S

AC-Switching Models, plastic, axial type

Cable type
Without potentiometer
E3F2-3Z□ E3F2-R2Z□ E3F2-DS10Z□-N

Accessories (Order Separately)

Reflectors

E39-R7

E39-R8

E39-R1 and E39-R3 → A-299

Tape Reflectors

E39-RSA

E39-RSB

Installation

**Mounting Bracket
Y92E-B18**

Note:
Hexagon bolt: M5 x 32
Material: plastic

**Lens Cap
E39-F31**

Precautions

The E3F2 Photoelectric Sensor is not a safety component for ensuring the safety of people which is defined in EC directive (91/368/EEC) and covered by separate European standards or by any other regulations or standards.

Degree of protection

The E3F2 photoelectric sensors have a degree of protection rated with IP67. In this case, the sensors have passed the OMRON heat shock test before the IP67-test of IEC 60529 (submersion at 1 m water depth for 30 min). Afterwards the sensors have been tested according to the OMRON waterproof test.

Heat shock: Alternating, fast temperature changes between -25°C and +55°C are executed for 5 cycles and 1 hour for each temperature. Function and isolation are checked.

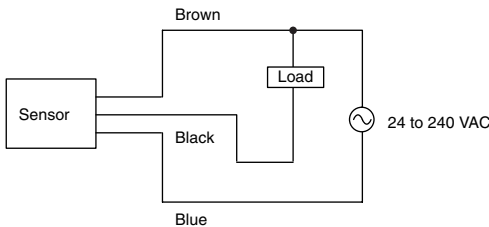
Water proof: The sensors are submerged alternating in water of +2°C and +55°C. 20 cycles with 1 hour for each temperature are executed. Function, water tightness and electrical isolation are checked.

Do not expose the photoelectric sensor to excessive shock during installation, keeping within IP 67 standards.

Wiring

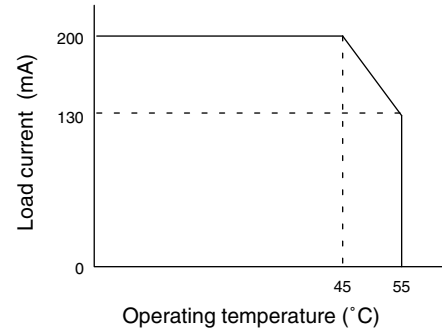
If the input/output lines of the photoelectric sensor are placed in the same conduit or duct as power lines or high-voltage lines, the photoelectric sensor could be induced to malfunction, or even be damaged by electrical noise. Separate the wiring, or use shielded lines as input/output lines to the photoelectric sensor.

Do not connect the black wire to the brown wire without a load. Direct connection of these wires may damage the photoelectric sensor (AC switching type).



When using the photoelectric sensor in the vicinity of an inverter motor, ensure to connect the protective earth ground wire of the motor to earth. Failure to ground the motor may result in malfunction of the sensor.

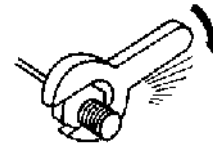
When you use the photoelectric sensor at temperatures exceeding 45°C, the load current must be within the described values as shown in the figure below.



Installation

Do not exceed a torque of

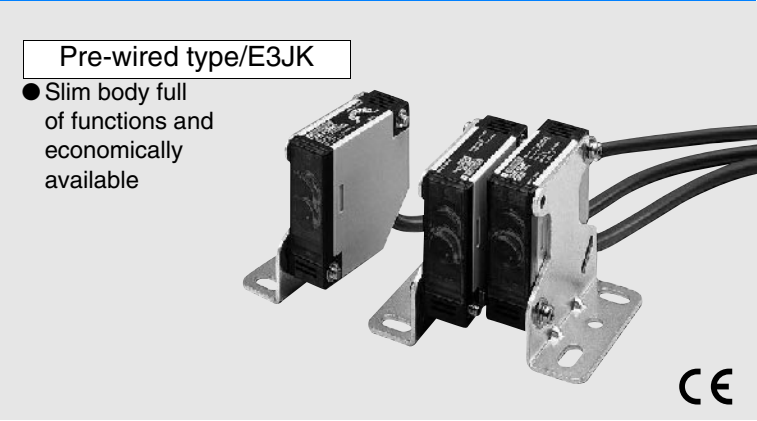
- 2.0 Nm (20 kgf cm) when tightening mounting nuts for plastic models
- 20.0 Nm (200 kgf cm) when tightening mounting nuts for metal models



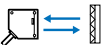

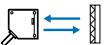





Built-in power supply photoelectric sensor

E3JK

Wide range voltage power supply



Sensor type	Shape	Connection method	Sensing distance	Output form	Output	Model
Through-beam		Pre-wired models	 5m	Light ON	Relay output	E3JK-5M1
				Dark ON		E3JK-5M2
				Light ON/ Dark ON (selectable)	DC transistor output	NPN: E3JK-5S3
Retroreflective model (with M.S.R. function)			 2.5m (3m)*	Light ON	Relay output	E3JK-R2M1
				Dark ON		E3JK-R2M2
			Light ON/Dark ON (selectable)	DC transistor output	NPN E3JK-R2S3	
					PNP E3JK-R2R3	
Retroreflective model (without M.S.R. function)			 4m (5m)*	Light ON	Relay output	E3JK-R4M1
				Dark ON		E3JK-R4M2
				Light ON/Dark ON (selectable)	DC transistor output (NPN)	E3JK-R4S3
Diffuse-reflective		 300mm	Light ON	Relay output	E3JK-DS30M1	
			Dark ON		E3JK-DS30M2	
			Light ON/Dark ON (selectable)	DC transistor output (NPN)	E3JK-DS30S3	

* The value within the parentheses indicates the sensing distance applied when the E39-R2 reflector is used.
 Note: The UL-listed model ends with "-US". (Example: E3JK-5M1-US). Note that the DC transistor type of the E3JK is UL-unlisted.

Accessories (Order Separately)

Slits

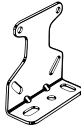
Slit width	Sensing distance	Minimum sensing object (typical)	Model	Quantity	Remarks
Width 1 mmx20 mm	E3JK-5□□	0.7 m	1 mm dia.	E39-S39	1 pc. each for emitter and receiver (total 2 pcs.) (Seal type long slit) Can be used with the through-beam model E3JK-5□□.

Reflectors

Name	Sensing distance (typical)		Model	Quantity	Remarks
Reflectors	E3JK-R2□□	2.5 m (rated value)	E39-R1	1	Attached to the E3JK-R2□□. Attached to the E3JK-R4□□.
	E3JK-R4□□	4 m (rated value)			
	E3JK-R2□□	3 m	E39-R2	1	---
	E3JK-R4□□	5 m			
Small reflector	E3JK-R2□□	1 m (5 mm) *	E39-R3	1	---
Tape Reflector	E3JK-R2□□	750 mm (200 mm) *	E39-RS1	1	The M.S.R. function is available.
	E3JK-R2□□	1.2 m (200 mm) *	E39-RS2		
	E3JK-R2□□	1.5 m (200 mm) *	E39-RS3		

* Values in parentheses indicate the minimum required distance between the sensor and reflector.
 Note: When the reflector used is other than the supplied one, set the sensing distance to about 0.7 times of the typical example as a guideline.

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L40	1	Supplied with E3JK

Note: If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.

Rating/Performance

E3JK

Sensor type		Through-beam		Retroreflective model (with M.S.R. function)		Retroreflective model (without M.S.R. function)		Diffuse-reflective	
Item	Model	E3JK-5M□	E3JK-5S3	E3JK-R2M□	E3JK-R2□3	E3JK-R4M□	E3JK-R4S3	E3JK-DS30M□	E3JK-DS30S3
Sensing distance		5 m		2.5 m (When using the E39-R1)		4 m (When using the E39-R1)		300 mm (White paper 100x100 mm)	
Standard sensing object		Opaque 14.8 dia. min.		Opaque: 75 mm dia. min.				---	
Differential distance		---						20% max. of sensing distance	
Directional angle		Both emitter and receiver: 3°C to 20°C		1° to 5°				---	
Light source (wave length)		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							
Current consumption	DC	3 W max.		2 W max.					
	AC	3 W max.		2 W max.					
Control output		Relay output: 250VAC 3 A (cosφ=1) max., 5 VDC 10 mA min.	DC SSR Negative common 48 VDC 100 mA max. Leak current 0.1 mA max. With load short-circuit protection	Relay output: 250VAC 3 A (cosφ=1) max., 5 VDC 10 mA min.	DC SSR Negative or positive common 48 VDC 100 mA max. Leak current 0.1 mA max. With load short-circuit protection	Relay output: 250VAC 3 A (cosφ=1) max., 5 VDC 10 mA min.	DC SSR Negative common 48 VDC 100 mA max. Leak current 0.1 mA max. With load short-circuit protection	Relay output: 250VAC 3 A (cosφ=1) max., 5 VDC 10 mA min.	DC SSR Negative common 48 VDC 100 mA max. Leak current 0.1 mA max. With load short-circuit protection
Life expectancy (relay output)	Mechanical	50 million times or more (switching frequency 18,000 times/hour)							
	Electrical	100 thousand times or more (switching frequency 18,000 times/hour)							
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		---						Single-turn adjustment	
Ambient illuminance		Incandescent lamp: 3,000 lux max.							
Ambient temperature		Operating: -25°C to 55°C, Storage: -30°C to 70°C (with no icing or condensation)							
Ambient humidity		Operating: 45% to 85%RH, Storage: 35% to 95%RH (with no condensation)							
Insulation resistance		20 M Ω min. at 500 VDC							
Dielectric strength		1,500 VAC at 50/60 Hz for 1 minute							
Vibration resistance	De-struction	10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions							
	Mal-function	10 to 55 Hz, 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions							

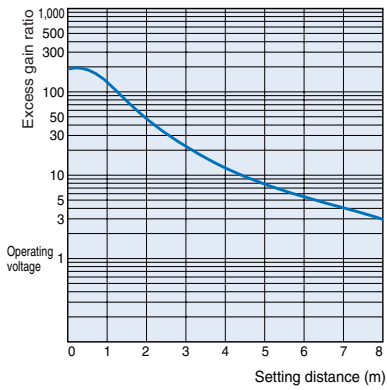
Sensor type		Through-beam		Retroreflective model (with M.S.R. function)		Retroreflective model (without M.S.R. function)		Diffuse-reflective	
Item	Model	E3JK-5M□	E3JK-5S3	E3JK-R2M□	E3JK-R2□3	E3JK-R4M□	E3JK-R4S3	E3JK-DS30M□	E3JK-DS30S3
Shock resistance	De-struction	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions							
	Mal-function	Destruction: 100m/s ² (approx. 10G) 3 times each in X, Y, and Z directions	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions	Destruction: 100m/s ² (approx. 10G) 3 times each in X, Y, and Z directions	Destruction: 500 m/s ² for 3 times each in X, Y and Z directions	Destruction: 100m/s ² (approx. 10G) 3 times each in X, Y, and Z directions	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions	Destruction: 100m/s ² (approx. 10G) 3 times each in X, Y, and Z directions	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions
Protective structure		IEC60529 IP64							
Connection method		Pre-wired models (standard length: 2 m)							
Weight (Packed state)		Approx. 420 g			Approx. 250 g				
Material	Case	ABS							
	Lens	Acrylics							
	Mounting bracket	Steel							
Accessories		Mounting bracket (with screws), nuts, instruction manual, reflector (retroreflective model only)							

Characteristic data (typical)

Excess Gain Ratio vs. Setting Distance

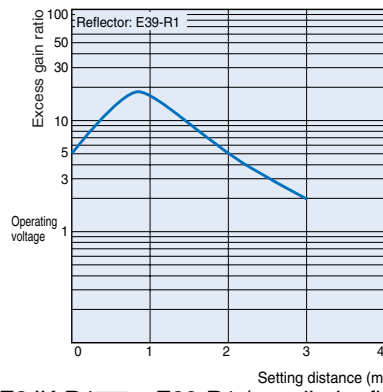
Through-beam model

E3JK-5□□



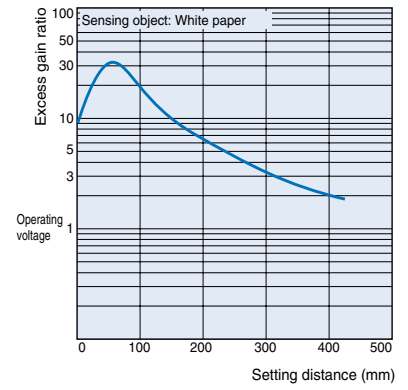
Retroreflective Models

E3JK-R2□□ + E39-R1 (supplied reflector)

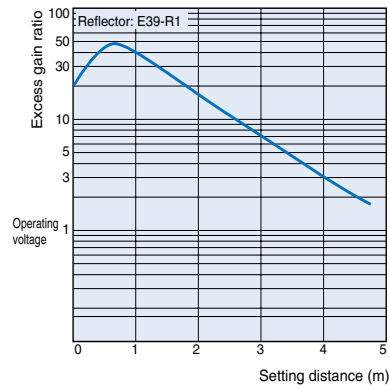


Diffuse-reflective

E3JK-DS30□□



E3JK-R4□□ + E39-R1 (supplied reflector)



Output Circuit Diagram

E3JK

Relay output

Model	Timing chart	Output circuit
E3JK-5M1 E3JK-5M2 E3JK-R2M1 E3JK-R2M2 E3JK-R4M1 E3JK-R4M2 E3JK-DS30M1 E3JK-DS30M2	<p>Incident Interrupted Light indicator (red) ON OFF L-ON(Ta) (E3JK-□□M1) ON OFF D-ON(Ta) (E3JK-□□M2) ON OFF</p>	<p>24 to 240 VAC 12 to 240 VDC Power source (Polarity Optional) Brown Blue White Black Gray Contact output Tc Ta Tb Built-in relay: G6C</p>

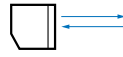


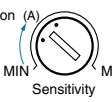
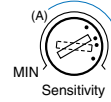
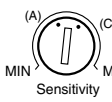
DC transistor output

Model	Timing chart	Output circuit
E3JK-5S3 E3JK-R2S3 E3JK-R4S3 E3JK-DS30S3	<p>Incident Interrupted Light indicator (red) ON OFF L-ON mode ON OFF D-ON mode ON OFF</p>	<p>24 to 240 VAC 12 to 240 VDC Power source Brown Blue White Black (L-ON) Gray (D-ON) Load</p>
E3JK-R2R3	<p>Incident Interrupted Light indicator (red) ON OFF L-ON mode ON OFF D-ON mode ON OFF</p>	<p>24 to 240 VAC 12 to 240 VDC Power source (Polarity Optional) Brown Blue D/ON Gray I1 L/ON Black I2 White Load 48 VDC max. $I1 + I2 < 100 \text{ mA}$</p> <p>Note: The output stage leakage currents are 0.1 mA max., respectively.</p>

Note: Connect to brown and blue on the emitter side.

Operation

Adjustment

Model	Item	Through-beam	Retroreflective Models	Diffuse-reflective
E3JK		Swing the receiver and emitter vertically and/or horizontally and set the adjuster in the center of the range where the indicator of the receiver turns ON.	Like the through-beam model, adjust the reflector and emitter/receiver. Since the directional angle of the emitter/receiver is 1 to 5°, adjust the emitter/receiver especially carefully.	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>With sensing object</p>  </div> <div style="text-align: center;"> <p>Without sensing object</p>  </div> <div style="text-align: center;"> <p>Setting</p>  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>Operation (A)</p>  </div> <div style="text-align: center;"> <p>(A) (B) Operation (C) Reset</p>  </div> <div style="text-align: center;"> <p>(A) (C)</p>  </div> </div> <ol style="list-style-type: none"> (1) If you have a sensing object as shown in the figure, turn the sensitivity adjuster clockwise (increase the sensitivity) until the indicator is turned ON, and define this adjuster position as (A). (2) Remove the sensing object, turn the sensitivity adjuster clockwise until the indicator is turned ON by a background object, and define this position as (B). (3) Turn the sensitivity adjuster counterclockwise (decrease the sensitivity) from (B) until the indicator is turned OFF, and define this position as (C). (4) The position in the middle of (A) and (C) is the optimum position. If the indicator is not turned ON by the background object at the maximum sensitivity, set the adjuster in the middle of (A) and maximum sensitivity. <ul style="list-style-type: none"> • The sensitivity adjuster may be damaged if an excessive force is applied.

Precautions

Correct Use

E3JK

Design

Power Reset Time

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

Wiring Considerations

Connection/Wiring

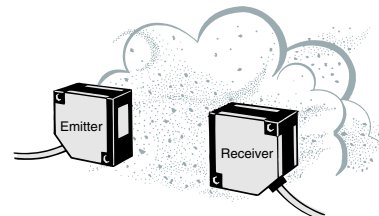
If the DC transistor output type is used, the sum of load currents of L-ON output (NO) and D-ON output (NC) should be within 100 mA. If the sum of load currents exceeds 100 mA, the load short-circuit protection may be activated. (The load short-circuit protection is reset by turning OFF the power of the photoelectric sensor.)

Miscellaneous

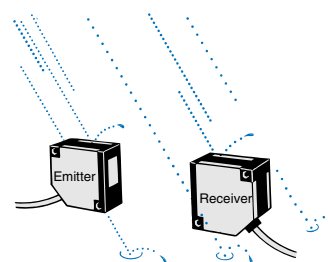
Ambient Conditions (Installation Area)

The E3JK will malfunction if installed in the following places.

- Places where the E3JK is exposed to a dusty environment.
- Places where corrosive gases are produced.



- Places where the E3JK is directly exposed to water, oil, or chemicals.

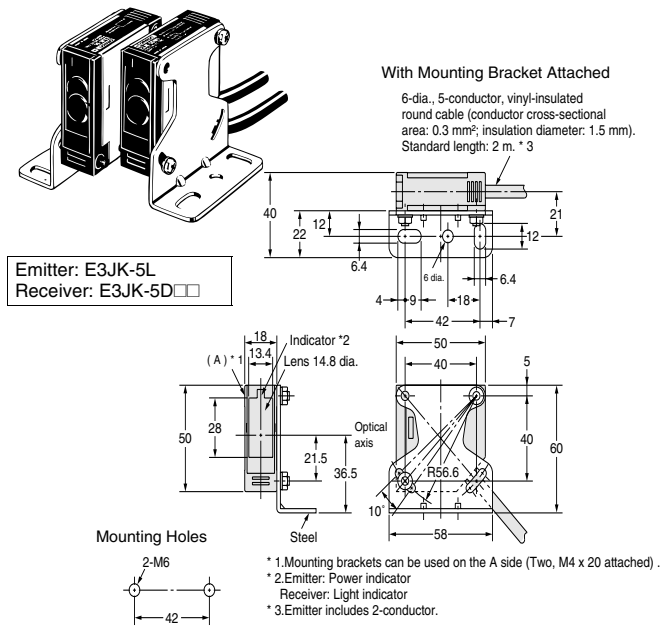


Dimensions (Unit: mm)

Sensors

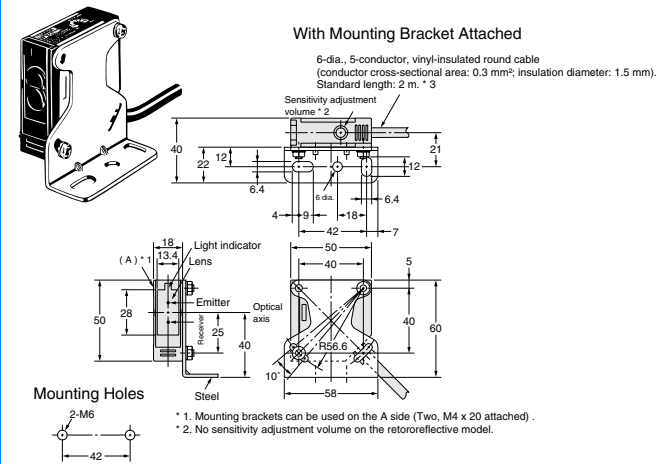
E3JK-5□□

CAD file E3JK_01



E3JK-R2□□
 E3JK-R4□□
 E3JK-DS30□□

CAD file E3JK_02



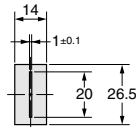
Accessories (Order Separately)

Seal type long slit (for E3JK)

E39-S39



Material: Polyester
 0.1 mm thick



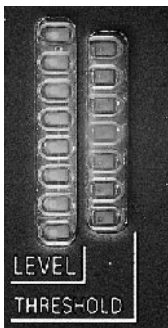
Color sensor (LED type)

E3MC

RGB Color Sensor Discriminates Delicate Differences in Color.



Features



Double Indication ensuring high visibility.

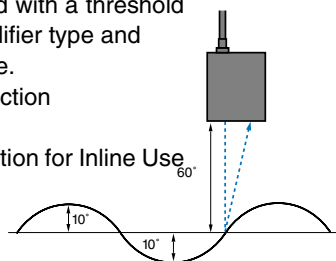
- Conformity with the registered colors can be monitored at eight levels. (Detection level indicators)
- Allows fine adjustment between fine or rough discrimination while monitoring the measured results. (Threshold level indicators)

Stable and Powerful Detection for Inline Use

Stable detection is assured with a threshold of ± 10 mm for built-in amplifier type and ± 4 mm for optical fiber type.

Fiber type and Stable detection ± 4 mm.

Stable and Powerful Detection for Inline Use
Mounting is easy.



Long-distance Sensing with Built-in Amplifier Type

Built-in amplifier type with a sensing distance of 60 ± 10 mm is available for a wide range of color discriminating applications.

Highly Resistant to Changes in Sensing Object Brightness and Ambient Temperature.

- OMRON's unique Free Angle Optics (FAO: multi-layer polarized filter) is highly resistant to changes in the tint or brightness of sensing objects. Capable of discriminating over 90 different colors.
- Wide temperature range from -20°C to 55°C and excellent detection stability.

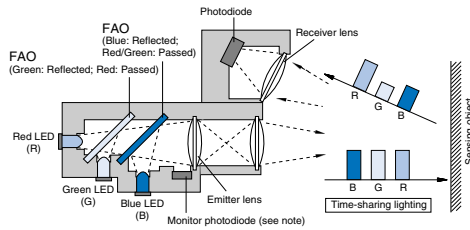
Maintenance-free LED Light Source

Incorporates RGB LED light sources with a long service life more than several tens of thousand hours.

Great maintenance-cost saver ensuring high performance (Halogen lamps used as light sources must be replaced or re-adjusted every nine months or so.)

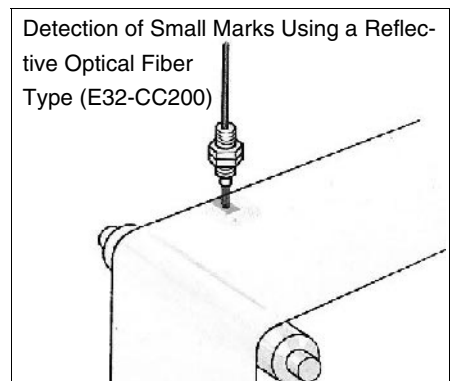
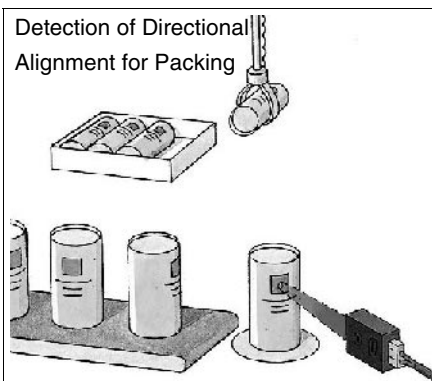
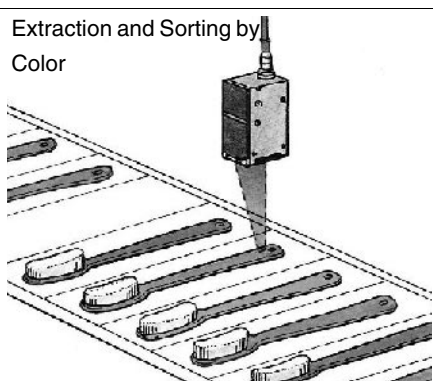
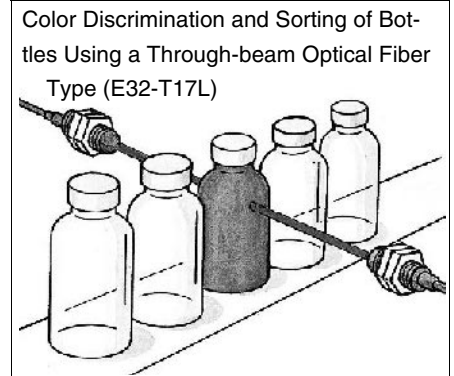
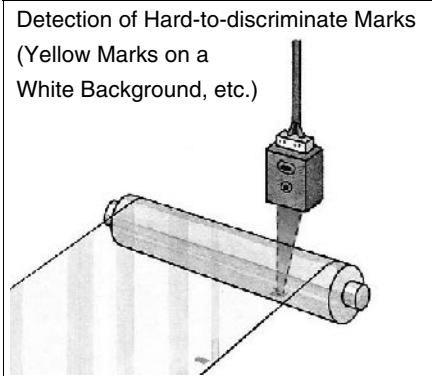
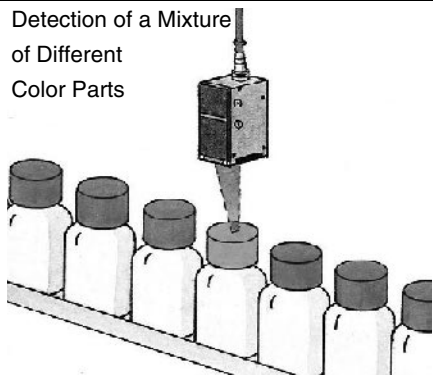
Principle of Detection

The E3MC detects colors by making use of the fact that the reflection ratio of a primary color (i.e. red, green or blue) reflected by an object varies with the chromaticity of the object. By using a high-tech, multi-layer polarized filter called FAO (free angle optics), the E3MC emits red, green and blue light on a single optical axis. The E3MC receives the light reflected by the sensing objects through the receiver and processes the red-green-blue ratio of the light to discriminate the color of the sensing object.



Note: The monitor photodiode compensates LED output deviation that may be caused by a temperature change. (Patent pending)

Application



Features

Excellent Protective Structure and Maintenance Performance

The amplifier unit uses a sturdy metal body. The unit including the fiber head satisfies the water resistance of IEC Standard IP66. You can use the E3MC without any problems in a wide range of applications. In addition to this, the M12 metal connector has improved maintenance performance.

Discriminating Delicate Color Differences

The detection level indicators are lit according to the degree of conformity between registered and detected colors. Delicate color differences are discriminated by setting the threshold to a superior level. (Fine discrimination is expected.)

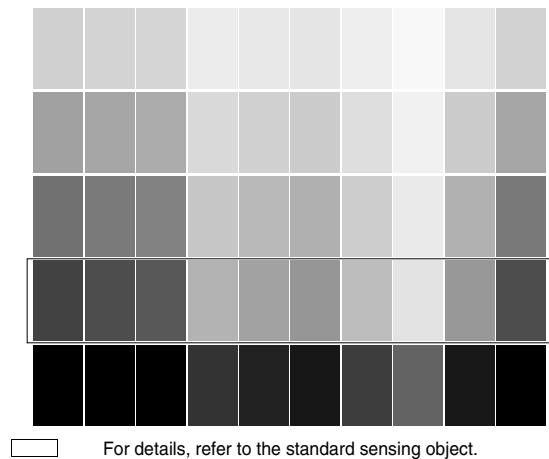
Sensor errors that may be caused by minor tint differences or dirt retention are prevented by setting the threshold to a lower level. (Rough discrimination is expected)



Conversion of Color Data into RGB Analog Data

The analog output type can control the color change history and distribution in analog form. Different type discrimination can also be performed without bank restrictions by CPU processing.

Color Chart


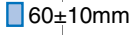
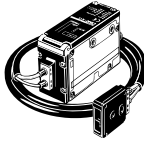
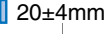





Ordering Information

Sensors


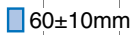

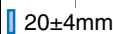


ON/OFF type

 Red light,  Green light,  Blue light

Structure	No. of outputs	Shape	Connection method	Sensing distance		Model		
						NPN output	PNP output	
Built-in Amplifier Type	1		Connector type Sensor I/O connector (cable length 2 m) is supplied.			E3MC-A11	E3MC-A41	
	4					E3MC-MA11	E3MC-MA41	
Optical Fiber Type	1					E3MC-X11	E3MC-X41	
	4					E3MC-MX11	E3MC-MX41	
General-purpose Optical Fiber Type	1			E32-CC200	*		E3MC-Y11	E3MC-Y41
	4						E32-T16	

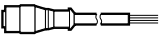
* Distance where 11 colors of standard sensing objects can be discriminated. As a typical example, 9 colors can be discriminated when 12 mm is set. Please contact us since the sensing distance should be defined.

Analog output type


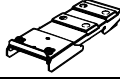
Structure	Shape	Sensing distance	Model
Built-in Amplifier Type			E3MC-A81
Optical Fiber Type			E3MC-X81
General-purpose Optical Fiber Type		Using E32-CC200 	E3MC-Y81

Accessories (Order Separately)

Sensor I/O Connectors

Shape	Model	Quantity	Remarks
	E39-C1 2M (2 m)	1 pc.	Supplied with the product.
	E39-C1 5M (5 m)	1 pc.	Please place an order when extending the cable.

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L114	2	For E3MC installation. (Can be inclined to 15°)
	E39-L115	1	For DIN track installation.

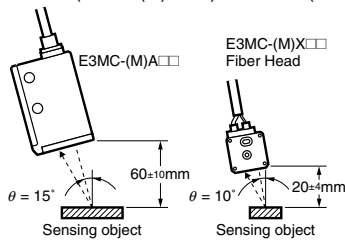
Rating/performance

ON/OFF type

Item	Structure Model	Built-in Amplifier Type		Optical Fiber Type		General-purpose Optical Fiber	
		E3MC-A□1	E3MC-MA□1	E3MC-X□1	E3MC-MX□1	E3MC-Y□1	E3MC-MY□1
Sensing distance	60±10 mm*1		20±4 mm		Depends on the recommended fiber. Refer to page AB- for details.		
Standard sensing object	*2						
Spot diameter	12 dia.		3-mm dia.		-		
Light source (wave length)	Red LED (680 nm), green LED (525 nm), blue LED (450 nm)						
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p) : 10% max.						
Current consumption	100 mA max.						
Control output	Load supply voltage 24 VDC max., load current 100 mA max. (residual voltage NPN output: 1.2 V max., PNP output: 2.0 V max.) Open collector output type						
Color discrimination mode	Mode C: RGB ratio detection, Mode I: RGB light intensity detection Switch selectable						
Output type	Conformity output: Output is ON when the detected color coincides with the registered color. Non-conformity output: Output is ON when the detected color does not coincide with the registered color. Switch selectable						
Mode selection	<div style="display: flex; flex-direction: column;"> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>E3MC-□11/-□41 Mode A (Factory-set)</p> </div> <div style="text-align: center;"> <p>Mode B (for remote teaching)</p> </div> </div> <div style="display: flex; justify-content: center; margin: 5px 0;"> ← ↔ → </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>E3MC-M□11/-M□41 Mode A (Factory-set)</p> </div> <div style="text-align: center;"> <p>Mode B (for remote teaching)</p> </div> </div> </div> <p style="font-size: 0.8em; margin-top: 5px;">Colors in parentheses are lead wire colors.</p>						
Remote control input (B mode only)	<p>The following control is performed according to the control signal input.</p> <ul style="list-style-type: none"> E3MC-□11/-□41□ Bank selection, remote teaching, or threshold selection E3MC-M□11/-M□41□ channel selection, remote teaching, threshold changing 						
Answer-back output (B mode only)	<p>Load current: 100 mA max.</p> <ul style="list-style-type: none"> NPN open collector output with a residual voltage of 1.2 V max. PNP open collector output with residual voltage 2.0 V max. (E3MC-(M)A41/-(M)X41/-(M)Y41) 						
Bank selection input (1 output only)	Selected between 4 banks (switching with the bank selection input and select button) Bank selection input response time: 50 ms max.						
External synchronous input	Response time: 1 ms max. (Note that the 4 output type cannot be used when the B mode is selected)						
Protective circuits	Protection from load short-circuit and reversed power supply connection						
Response time	1 output type: Standard mode: 3 ms max., high-speed mode: 1 ms max. (switch selectable) 4 output type: Standard mode: 6 ms max., high-speed mode: 2 ms max. (switch selectable)						
Discriminating color registration	4 colors can be registered, teaching system (threshold permits fine adjustment)						
Timer function	OFF delay fixed at 40 ms (ON/OFF switch selectable)						
Ambient illuminance	Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.						
Ambient temperature	Operating: -20 to 55°C, Storage: -30 to 70°C (with no icing)						
Ambient humidity	Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)						
Permissible fiber bending radius	-		10 mm min.		Varies with the type of recommended fiber		
Insulation resistance	20 M Ω min. at 500 VDC						
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute						
Vibration (resistance) *3	Destruction: 10 to 55 Hz, 1.0 mm double amplitude or 150 m/s ² for 2 hrs each in X, Y, and Z directions						

Item	Structure Model	Built-in Amplifier Type		Optical Fiber Type		General-purpose Optical Fiber	
		E3MC -A□1	E3MC -MA□1	E3MC -X□1	E3MC -MX□1	E3MC -Y□1	E3MC -MY□1
Shock (resistance) *4		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions					
Protective structure		IEC 60529 IP66 (with Protective Cover attached)					
Connection method		Connector type [sensor I/O connector (cable length 2 m)]					
Weight (Packed state)		Approx. 350 g		Approx. 400 g		Approx. 350 g	
Material	Case	Zinc die-cast					
	Operation panel cover	PES					
	Fiber head	-		ABS		-	
Accessories		Cross-shaped recess screw M5x6 (with spring washer), sensor I/O connector (cable length 2 m), instruction manual					

*1. C mode, standard mode (response time), threshold: Distance range where 11 colors of standard sensing objects can be discriminated when $\theta = 15^\circ$ (E3MC-(M) A□□) or $\theta = 10^\circ$ (E3MC-(M) X□□) in the following figure in the standard mode.



*2. Standard Sensing Objects

Color (11 standard colors)	Munsell color notation
White	N9.5
Red	4R 4.5/12.0
Yellow/red	4YR 6.0/11.5
Yellow	5Y 8.5/11.0
Yellow/green	3GY 6.5/10.0
Green	3G 6.5/9.0
Blue/green	5BG 4.5/10.0
Blue	3PB 5.0/10.0
Blue/purple	9PB 5.0/10.0
Purple	7P 5.0/10.0
Red/purple	6RP 4.5/12.5

*3. 0.75-mm double amplitude or 100 m/s² when using a mounting bracket

*4. 300 m/s² when using a mounting bracket

Rating/Performance

Analog output type

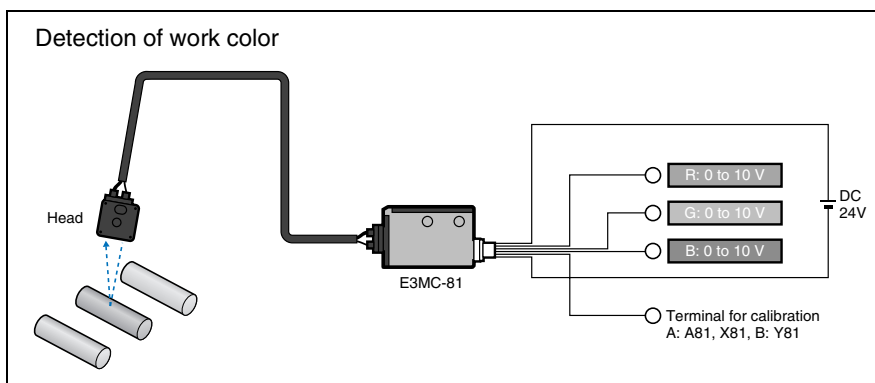
Item	Structure Model	Built-in Amplifier Type		Optical Fiber Type	General-purpose Optical Fiber Type
		E3MC-A81		E3MC-X81	E3MC-Y81
Sensing distance *1		60±10 mm		20±4 mm	5 ±1mm (When using the E32-CC200)
Spot diameter		12 dia.		3-mm dia.	Varies with the recommended fiber.
Light source (wave length)		Red LED (680 nm), green LED (525 nm), blue LED (450 nm)			
Power supply voltage		24 V DC ±10%, ripple (p-p) 10% or less			
Power consumption		100 mA max.			
Control output		3 analog independent outputs (RGB) 0 to 10 VDC without output short-circuit protection			
	Resolution	300 mV max.			
	Load current	5 mA max.			
	Response speed	1.7 ms max.			
	Temperature drift	±0.3% FS/°C max.			
	Power restoration time	100 ms max. after power-on			
Calibration input A, B		24 VDC			
	Signal	1 ms (24 VDC, HIGH active)			
	Response time	600 ms max.			
	Calibration value	Terminal A: 10±0.2V		Terminal B: 7±0.2V	
Protective circuits		Reverse polarity protection			
Ambient illuminance		Incandescent lamp: Illumination on optical spot: 1,000 lux max.			
Ambient temperature		Operating: 0°C to 50°C, Storage: -30°C to 70°C (with no icing or condensation)			
Ambient humidity		Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)			
Permissible fiber bending radius		---	10 mm min.		Varies with the type of recommended fiber
Insulation resistance		20 M Ω min. at 500 VDC			
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute			
Vibration (resistance) *2		Destruction: 10 to 55 Hz, 1.0 mm double amplitude or 150 m/s ² for 2 hrs each in X, Y, and Z directions			
Shock (resistance) *3		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions			
Protective structure		IEC 60529 IP66 (with Protective Cover attached)			
Connection method		M12 dedicated connector type			
Weight (Packed state)		Approx. 300 g		Approx. 350 g	Approx. 300 g
Material	Case	Zinc die-cast			
	Cover	PES			
	Fiber head	ABS			
Accessories		Connection cable 2 m (E39-C1), instruction manual			

*1. Distance range where calibration can be made with standard white paper (N9.5).

*2. 0.75 mm double amplitude or 100 m/s² when using a mounting bracket

*3. 300 m/s² when using a mounting bracket

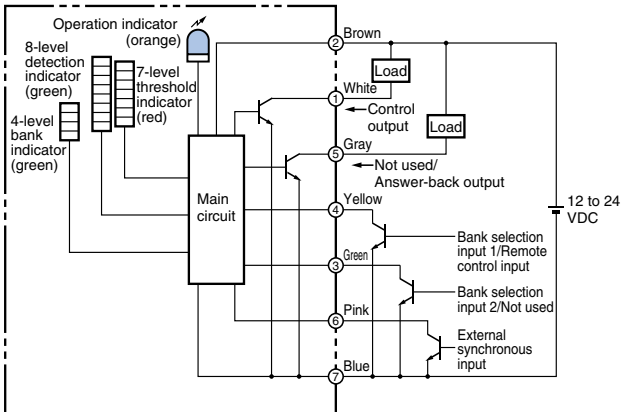
Use (Typical)



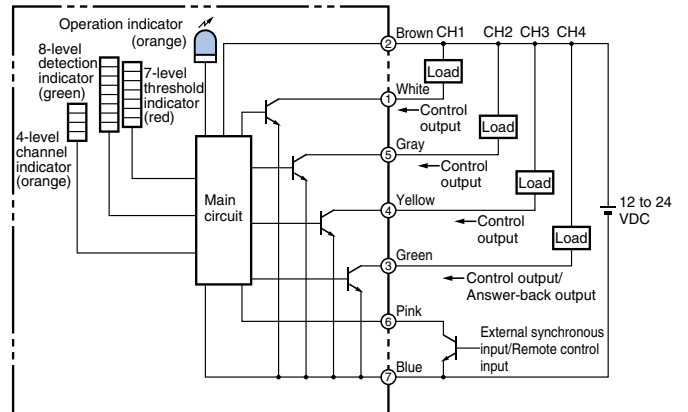
Output Circuit Diagram

NPN model

E3MC-□11 (1 output type)

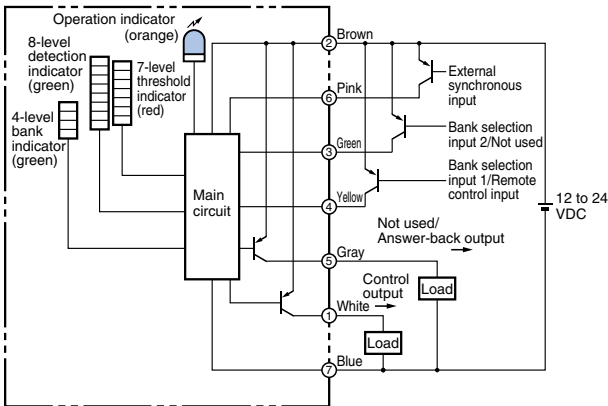


E3MC-M□11 (4 output type)

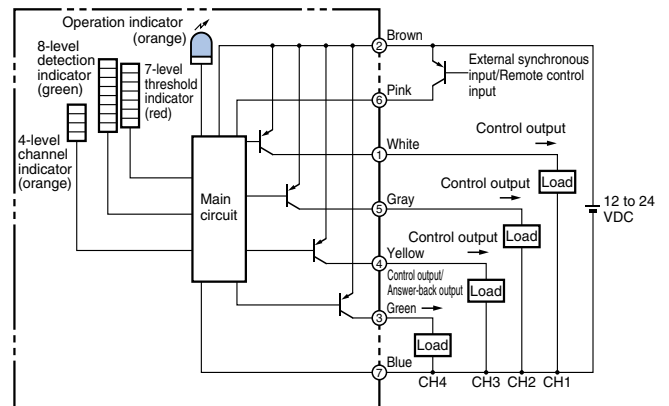


PNP type

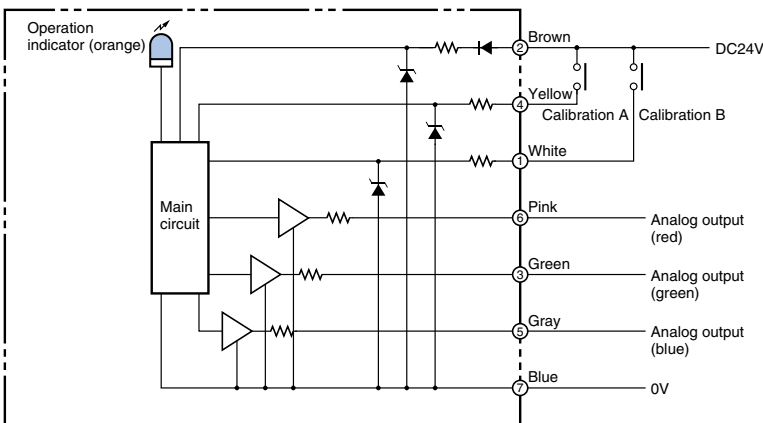
E3MC-□41 (1 output type)



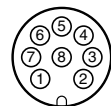
E3MC-M□41 (4 output type)



Analog output type



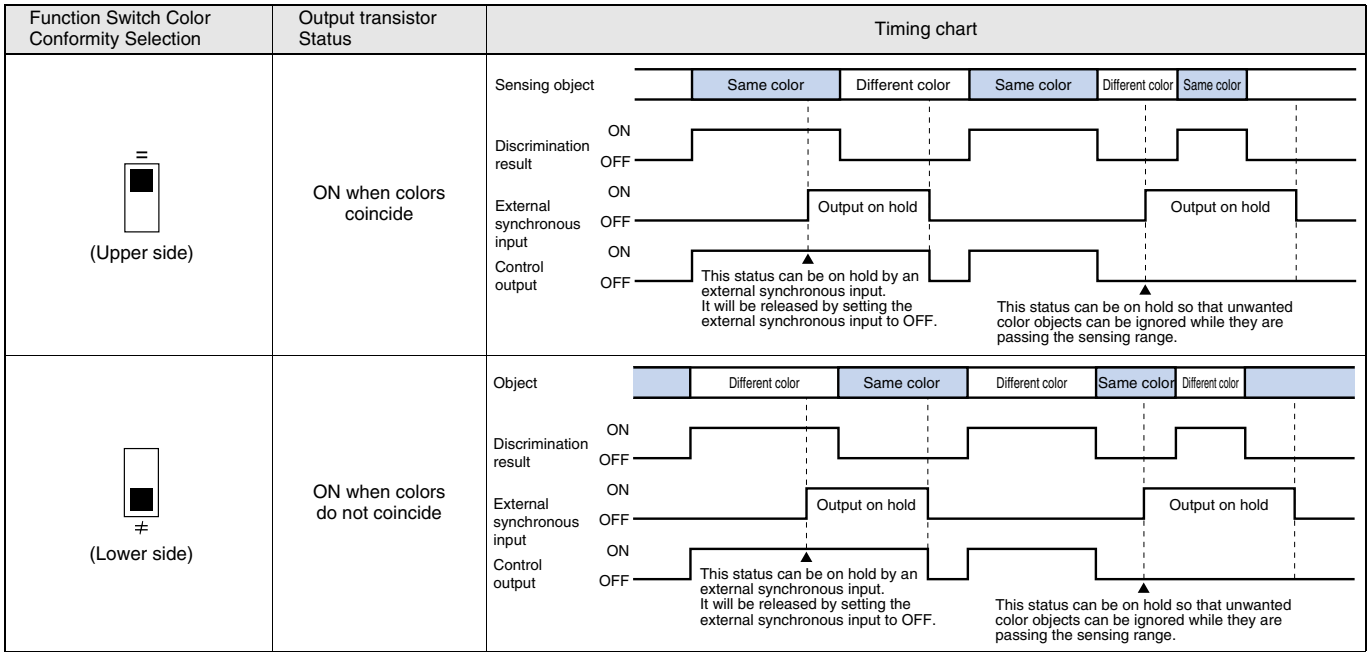
Connector Pin Arrangement



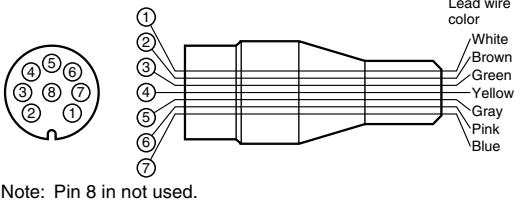
Note: Pin 8 in not used.

Timing chart

ON/OFF type



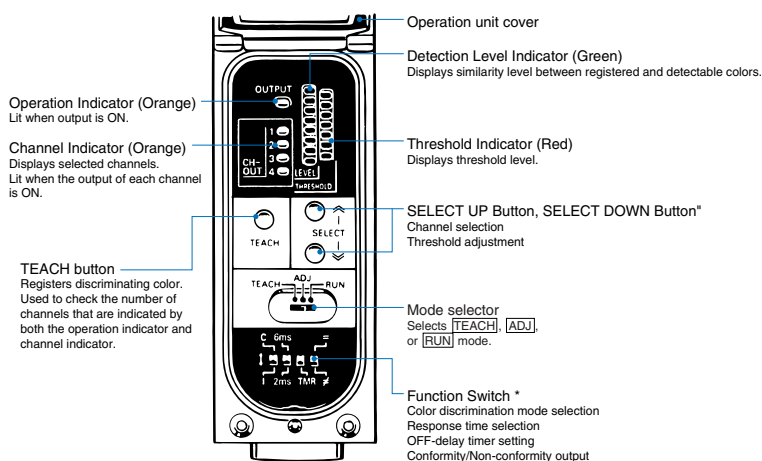
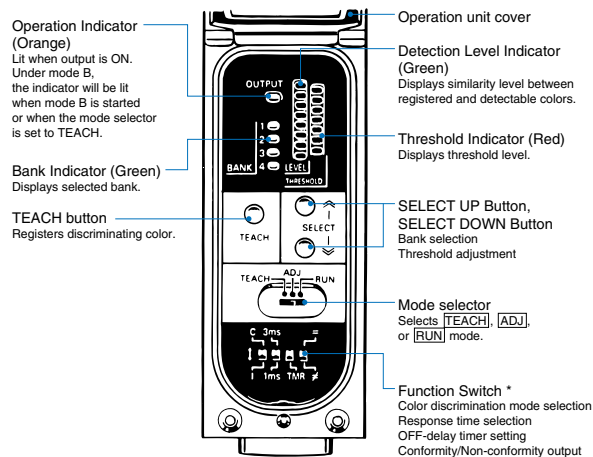
Connectors (Sensor I/O connectors)

Model	Internal Wiring	Pin No.	Wire color	ON/OFF type A mode		Analog output E3MC-□81
				E3MC-□11, E3MC-□41	E3MC-M□11, E3MC-M□41	
E39-C1 2M (2 m) E39-C1 5M (5 m)	 <p>Note: Pin 8 is not used.</p>	①	White	Output	Output 1	Calibration B
		②	Brown	Power supply (+V)	Power supply (+V)	Power supply (+V)
		③	Green	Bank selection input 2	Output 4	Analog output G (green)
		④	Yellow	Bank selection input 1	Output 3	Calibration A
		5	Gray	-	Output 2	Analog output B (blue)
		6	Pink	External synchronous input	External synchronous input	Analog output R (red)
		7	Blue	Power supply (0 V)	Power supply (0 V)	Power supply (0 V)

Part Names/Functions

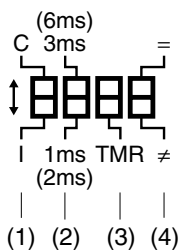
ON/OFF type

- E3MC-A□□ (1 output Models)
- E3MC-X□□ (1 output Models)
- E3MC-Y□□ (1 output Models)
- E3MC-MA□□ (4 output Models)
- E3MC-MX□□ (4 output Models)
- E3MC-MY□□ (4 output Models)



* Function Switches (Setting of various functions)

The following settings can be made with the function switches. (Settings can be made in the [RUN] mode or [ADJ] mode.)
 (For the 4 output type, all channels are the target of settings.)



① Color Discrimination Mode Selection (Mode C is recommended for normal applications.)

- Mode C: Color discrimination is performed according to R (red), G (green), and B (blue) ratio of the reflection light even if the sensing objects fluctuate up and down within the rated sensing range.
- I (Mode I): Color discrimination is performed according to the light intensity. This mode ensures a finer color (similar colors or neutral color such as white, gray or black) discrimination than mode C.

2. Response Time Selection (Note: Figures in parentheses are for the 4 output models.)

- 3 ms (6 ms): E3MC provides a stable detection of minute differences of color. Set the response time to 3 ms for usual applications.
- 1 ms (2 ms): E3MC will be in quick-response operation. Set the response time to 1 ms if high-speed response is required.

3. OFF-delay Timer Setting

- No indication: No timer setting
- TMR: A 40 ms OFF delay timer is set for control output.

4. Conformity/Non-conformity Output

- =: Output is ON when the detected color coincides with the registered color.
- ≠: Output is ON when the detected color does not coincide with the registered color.

Note: Each pin of the function switch is factory-set to the upper position.

Analog output type

Power indicator only

Operation

ON/OFF type

Setting Procedure

1-output Models (E3MC-A□□/ E3MC-X□□/ E3MC-Y□□)

1. Bank Selection

Set the Mode Selector to the **TEACH** mode and then select the **BANK** using the **SELECT** button.

2. Color Registration

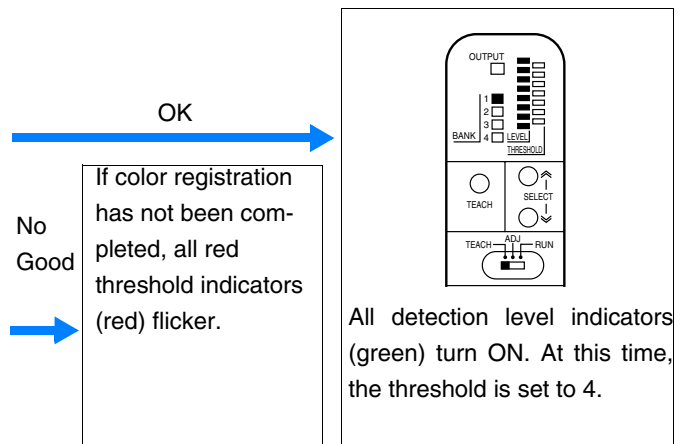
Locate the registered object at the detection point and press the **TEACH** button.

3. Threshold Adjustment (If Required)

Place the sensing object, press the **SELECT** button in the **ADJ** mode, and make adjustment. (Adjustment can be made without a sensing object.) The bank selected in the **ADJ** mode is the bank selected in the **TEACH** or **RUN** mode.

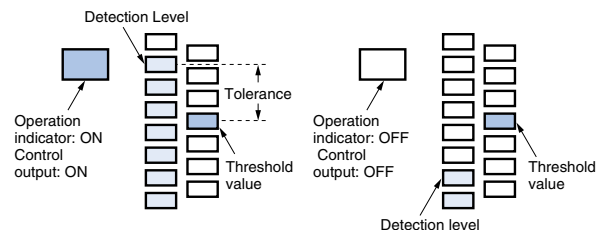
Operation

Make measurement in the **RUN** mode. The registered color can be selected with bank selection input.



Detection Level and Tolerance

As the detected color becomes closer to the registered color (colors look alike), the number of lit detection level indicators (green) increase. The control output will turn ON if the detection level (green) exceeds the threshold level (red) and turn OFF if the detection level does not exceed the threshold level. (For conformity output setting) Set the threshold to a higher level for highly-precise color discrimination or to a lower level to allow margins for discriminated colors (ignore minor tint differences, dirt retention or like).



4 output Models (E3MC-MA□□/E3MC-MX□□/E3MC-MY□□)

1. Channel Selection

Set the Mode Selector to the **TEACH** mode and then select the channel using the SELECT button.

2. Color Registration

Locate the registered object at the detection point and press the TEACH button.

3. Threshold Adjustment (If Required)

ADJ
(Adjustment can be made without a sensing object)
The bank selected in the **ADJ** mode or **TEACH** mode will become the bank for the **RUN** mode.

OK

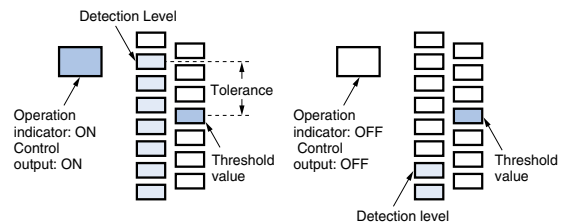
All detection level indicators (green) turn ON. The threshold is set to 4.

Not Good

If color registration has not been completed, all red threshold indicators (red) flicker.

Detection Level and Tolerance

As the detected color becomes closer to the registered color (similar colors), the number of lit detection level indicators (green) increase. The control output will turn ON if the detection level (green) exceeds the threshold level (red) and turn OFF if the detection level does not exceed the threshold level. (For conformity output setting) Set the threshold to a higher level for highly-precise color discrimination or to a lower level to allow margins for discriminated colors (ignore minor tint differences, dirt retention or like).



Operation

Detection is made in the **[RUN]** mode. The output ON/OFF status of each channel is displayed on the channel indicators. Double-displayed channels can be checked and selected by pressing the button.

For indicating detection level and threshold value for other channels

Press the SE-LECT button.

For checking which channel is indicated

Press the TEACH button

Displays the channel the detection level of which is currently indicated in (CH-OUT). (For three seconds)

Displays the selected channel in (CH-OUT) (for three seconds) and indicates the detection level and threshold value of the selected channel.

Registered Color Selection (Bank Selection Input)

1-output Models Only

In the **[RUN]** mode, bank selection can be made externally with the bank selection input 1 (yellow) and input 2 (green). The selected bank is indicated by the bank selection indicator.

NPN (E3MC-A11/-X11/-Y11)

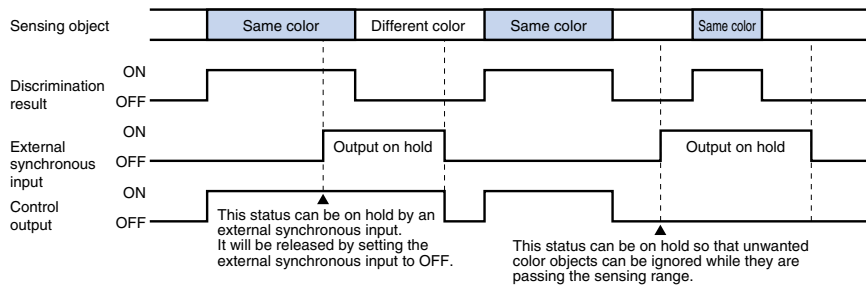
Bank	Input 1	Input 2
1	OPEN	OPEN
2	GND	OPEN
3	OPEN	GND
4	GND	GND

PNP (E3MC-A41/-X41/-Y41)

Bank	Input 1	Input 2
1	OPEN	OPEN
2	Vcc	OPEN
3	OPEN	Vcc
4	Vcc	Vcc

External synchronous input function

The measurement results will be directly output to the control output if the input from the external synchronous input terminal (pink) is set to OFF. The output will hold the previous status if the input of the external synchronous input terminal is set to ON. External synchronous input is valid in **[RUN]** or **[ADJ]** mode. As for the 4-output models, this function applies to the output of all the channels.



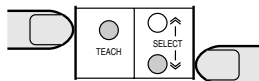
Remote teaching (remote control function)

Mode Setting

When using remote teaching (remote control function), you must set the Sensor to mode B.

Setting Method

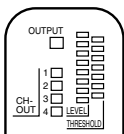
Apply power to the Sensor while pressing the SELECT DOWN button and TEACH button at the same time.



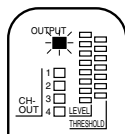
Checking Method

Whether the E3MC is operating in mode A or B can be checked with the operation indicator after mode setting (indicated for 3 s) or in the TEACH mode.

Mode A:
Operation indicator is OFF.



Mode B:
Operation indicator is ON.



- Note: 1. The Sensor is set to mode A before shipment.
- 2. The current mode selected does not change after the Sensor is turned OFF.
- 3. The remote control function is available in the RUN mode or ADJ mode only.
- 4. When mode B is selected, the E3MC-M□ has three outputs. In addition to this, the external synchronous input function is unusable.
- 5. The same switching procedure can be used for changing to mode A.

Remote Teaching Method

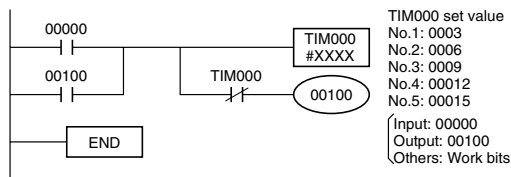
1 Remote teaching with manual input through a mechanical switch
Short-circuit the remote control input for 1.5 s or more to either of the following terminals according to the E3MC model.

NPN type (E3MC-□□11)	Connected to GND (blue)
PNP type (E3MC-□□41)	Short-circuit to Vcc (Brown) terminal.

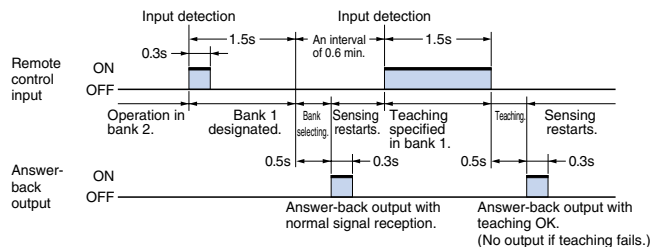
2 Remote control of teaching and bank selection through the PLC or PT
Input one of the following signals as a remote control input. Only when the signal is accepted properly, an answer-back output is provided for 0.3 s .

No.	Control signal	E3MC-□	E3MC-M□□
1	ON OFF (0.3s pulse)	Bank 1 selected.	Channel 1 selected.
2	ON OFF (0.6s pulse)	Bank 2 selected.	Channel 2 selected.
3	ON OFF (0.9s pulse)	Bank 3 selected.	Channel 3 selected.
4	ON OFF (1.2s pulse)	Bank 4 selected.	Not used.
5	ON OFF (1.5s pulse)	To the selected bank Teaching	To the selected channel Teaching

The following is an example of ladder programming.



The following is an example of a timing chart of teaching after bank selection.

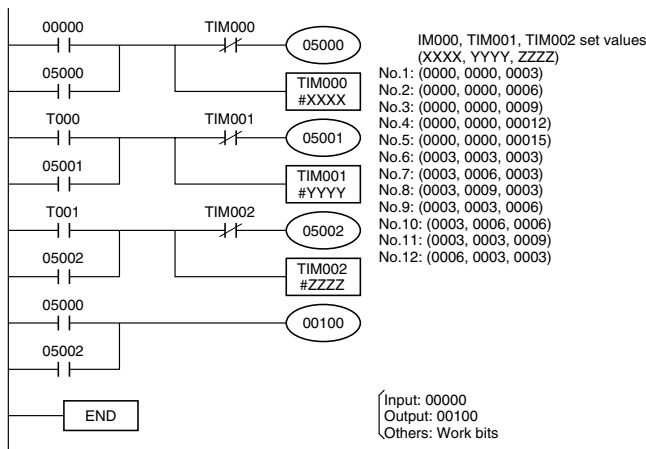


3 Remote control of threshold adjustments through the PLC or PT

Input one of the following signals as a remote control input. Only when the signal is accepted properly, the threshold is changed and an answer-back output is provided for 0.3 s .

No.	Control signal	All E3MC models	Threshold level and indication
6	ON OFF (0.3s pulse)	Threshold 1 selected.	□ Tolerance 1
7	ON OFF (0.3s pulse)	Threshold 2 selected.	□ Tolerance 2
8	ON OFF (0.3s pulse)	Threshold 3 selected.	□ Tolerance 3
9	ON OFF (0.3s pulse)	Threshold 4 selected.	□ Tolerance 4
10	ON OFF (0.3s pulse)	Threshold 5 selected.	□ Tolerance 5
11	ON OFF (0.3s pulse)	Threshold 6 selected.	□ Tolerance 6
12	ON OFF (0.3s pulse)	Threshold 7 selected.	□ Tolerance 7

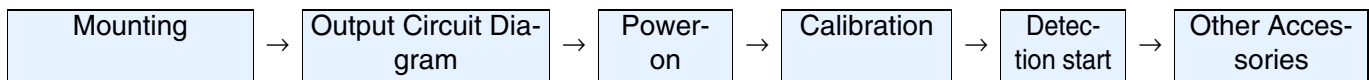
The following is an example of ladder programming for setting control signals. Full control of the E3MC is possible using this function together with function 2.



- Note: 1 . The admissible error of each signal pulse is ± 0.1 s max.
2 . A minimum interval of 0.6 s is required between signals.
3 . Threshold 4 is set after teaching.

Analog output type

Setting Procedure for Setting the E3MC-MA□81



Start detection after making setting in order of the above.

Calibration

This sensor has a calibration function that sets the output voltages of RGB to the same value using the standard white. For the A and X types, use the No. 4 terminal (yellow) to set the output values to 10 V. For the Y type, use the No. 1 terminal (white) to set them to 7 V.

- ① Set the standard white to the detection position.
- ② Input a 24V 1 ms or more signal to the calibration terminal.
- ③ It takes about 600 ms to make calibration.
- ④ Check the RGB outputs.
- ⑤ Remove the standard white and start detection.

Precautions

- If the color used for calibration operation is other than white-based colors, the operation is canceled to return to the previous status since the outputs cannot be set to the same value.
- Note that if the No. 1 terminal (white) is used to perform the calibration operation of the A or X type, the output values are set to 7 V and its capability cannot be exhibited fully.
- If the No. 4 terminal (yellow) is used to perform the calibration operation of the Y type, the operation will be insufficient since output compensation cannot be made. Therefore, always use the No. 1 terminal (white).

Precautions

Correct Use

Common to E3MC series

Design

Power Reset Time

E3MC is ready to sense an object in 100 ms after power-on. Therefore, use the devices connected to E3MC 100 ms after power-on. If the load and E3MC are connected to different power supplies, always power on E3MC first. Especially for fine detection after power-on, warm up the system for about 15 minutes.

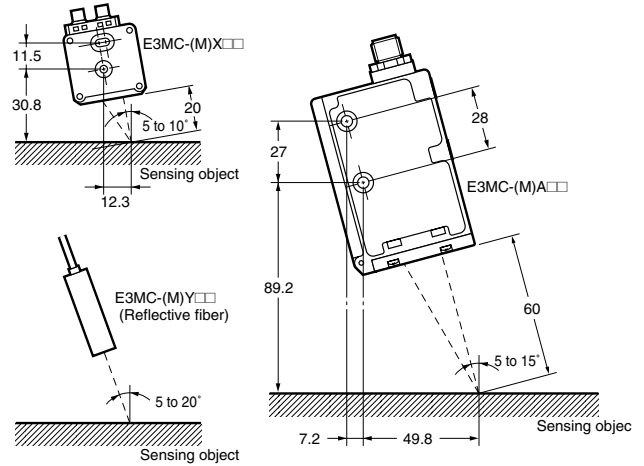
Power OFF

The E3MC may output a single pulse when the control power supply is turned OFF. If E3MC is connected to a timer or counter to which power is supplied from an independent power supply, E3MC will be more likely to output a single pulse when the control power supply is turned OFF. Therefore, supply power to the timer or counter from the same power supply for the E3MC.

Technical Guide

Detection of Metal or Glossy Objects

The color detection capability will be improved by changing the mounting angle of the Sensor so that regularly reflected light will not enter. The mounting angle of the E3MC-(M)X□□ can be adjusted about 10° with its mounting holes.



On the other hand, sensing objects such as metal or transparent plastic cases may be detected by allowing regular reflection.

Detection of White, Gray or Black Objects

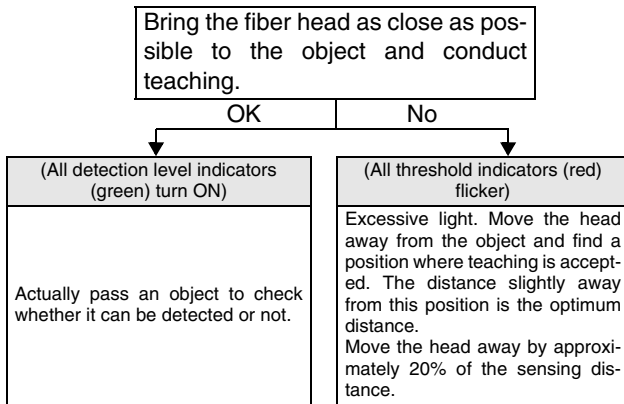
When registering white, gray, black or other neutral-color objects, change the color discrimination mode to the **Mode 1** mode to achieve a more stable intensity discrimination.

External Light

The E3MC may malfunction if it directly receives external light interference. Provide a cover to shut-out such external light interference.

Adjustment of Sensing Distance of General-purpose Optical Fiber Type

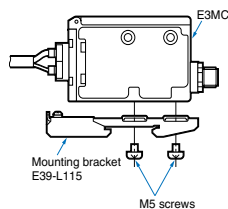
Unlike the E3MC-A or E3MC-X, the E3MC-Y may require adjustment of its sensing distance depending on the reflection rate. This also applies to the through-beam type.



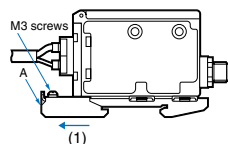
DIN Track Mounting/Removal with the E39-L115

Mounting

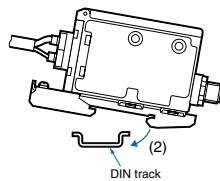
1. Attach the E39-L115 Mounting Bracket to the E3MC with four M5 screws.



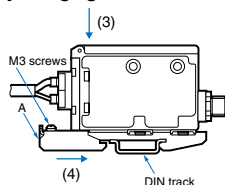
2. When mounting the E3MC to the DIN track, loosen the M3 screw of the Mounting Bracket and slide part A in the direction indicated by arrow ①.



3. Mount part (2) to the DIN track.



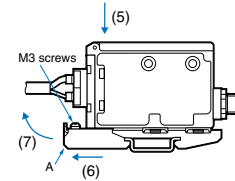
4. Press the E3MC in the direction indicated by arrow ③ and slide part A in the direction indicated by arrow ④ until the Mounting Bracket correctly engages with the DIN track.



5. Tighten the M3 screw of the Mounting Bracket to secure the Mounting Bracket.

(Dismantling)

Loosen the M3 screw of the E39-L115, press the E3MC in the direction indicated by arrow (5) and slide part A in the direction indicated by arrow (6). Then lift up the E3MC in the direction indicated by arrow (7) to remove the E3MC with the E39-L115.



Others

EEPROM Error

If a write error occurs (the buzzer beeps and the operation indicator and bank indicator flicker) due to power-off, static electricity or other noise during write to EEPROM, perform teaching or threshold level setting again.

Protective Cover

Tighten the operation cover to a torque of 0.2 to 0.3 Nm to ensure proper waterproofing.

Built-in Amplifier Type installation

Tightening Force

For case installation, tighten it to the torque of 2.3 Nm max.

Sensor installation

This Sensor does not have the mutual interference prevention. When performing precision detection, use the Sensor with a cover for protection against disturbance light to ensure that the beams of incandescent and fluorescent lamps do not enter the fiber head and lens surface directly.

Optical Fiber Type

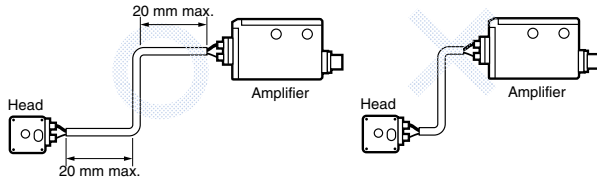
Installation

Tightening Force

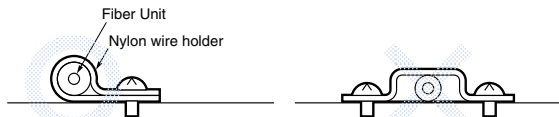
For head installation, tighten it to the torque of 0.54 Nm max.

Handling the Fiber Unit

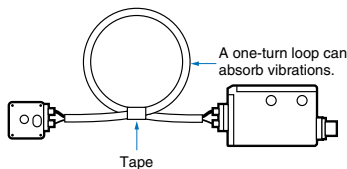
- Do not pull or press the Fiber Unit.
- The bending radius of the fiber should be not less than the admissible bending radius given in Ratings/performance.
- Do not bend the fiber within 20 mm from the head or amplifier coupling portion.



- Do not give compression or load.



- The Fiber Head could be break by excessive vibration. To prevent this, the following is effective:

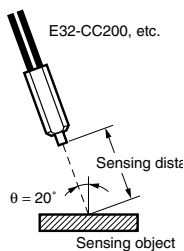


General-purpose Optical Fiber Type

Design

Definition of Sensing Distance of a Reflective Fiber

- The sensing distance of reflective fiber is the sensing distance of the Sensor located obliquely to the sensing object as shown in the following illustration.
- Set to C mode and standard mode (response time), and threshold set to the standard level with an inclination angle of 20 degrees



Recommended Fiber: Reflective Optical Fiber

The following optical fibers are recommended for use with the E3MC-(M)Y□□.

Model	Sensing distance*1
E32-DC200	5 mm
E32-CC200*2	5 mm
E32-D32L*3	4.5 mm
E32-D11L	5 mm

- *1. Distance where 11 colors of standard sensing objects can be discriminated. As a typical example, 9 colors can be discriminated when 12 mm is set.
- *2. The fiber to be inserted into the emitter is indicated with white lines. Insert the amplifier fiber into the lower emitter section.
- *3. The fiber to be inserted into the emitter is indicated with dotted yellow lines. Insert the amplifier fiber into the lower emitter section.

Recommended Fiber: Through-beam Fiber

The following optical fibers are recommended for use with the E3MC-(M)Y□□.

Model	Sensing distance
E32-TC200	30 mm
E32-T11L	60 mm
E32-T16	200 mm
E32-T17L	1.1 m

* Distance where red, yellow and blue films can be discriminated stable.

Mounting

Insertion

The inserted Fiber Unit comes in contact with the internal rubber packing first. Insert the Fiber Unit further unit it comes in contact with the innermost end.

Sensor installation

Tighten the Fiber Unit with a screwdriver to a torque of 0.2 Nm.

Fibers

Among the recommended fibers, the E32-CC200 and E32-D32L have white or dotted yellow lines on the fiber to be inserted into the emitter. When using the E3MC-(M)Y□□, insert the fiber with the line into the emitter section at the bottom of the amp.

Common to Fiber Units

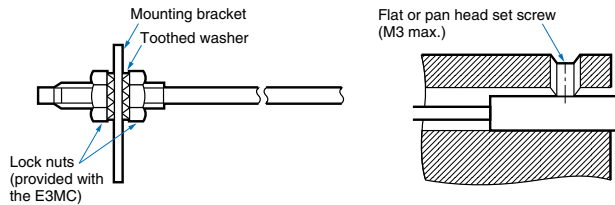
Mounting

Tightening Force

- The tightening force applied to the Fiber Unit should be as follows:

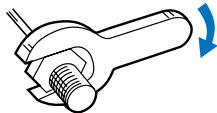
(Screwed type)

(Columnar type)



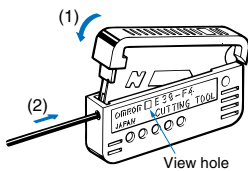
Fiber Units	Clamping torque
M3/M4 screw	0.78 Nm max.
M6 screw	0.98 Nm max.
2-dia. column	0.29 Nm max.
3-dia. column	0.29 Nm max.
E32-T16	0.49 Nm max.

- Use a proper-sized wrench.



Cutting Fiber

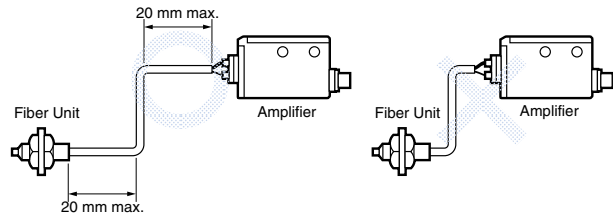
- Insert a fiber into the Fiber Cutter and determine the length of the fiber to be cut.
- Press down the Fiber Cutter in a single stroke to cut the fiber.



- The cutting holes cannot be used twice. If the same hole is used twice, the cutting face of the fiber will be rough and the sensing distance will be reduced. Always use an unused hole.

Connection

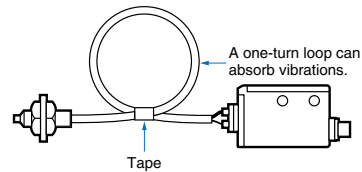
- Do not pull the Fiber Unit with force exceeding 9.8 N or press the Fiber Unit with force exceeding 29.4 N. The fiber is so thin that the utmost attention will be required to handle the fiber.
- Do not bend the end of the Fiber Unit.



- Do not apply excess force on the Fiber Units.



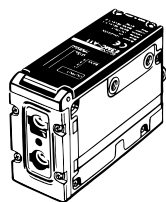
- The Fiber Head could break by excessive vibration. To prevent this, the following is effective:



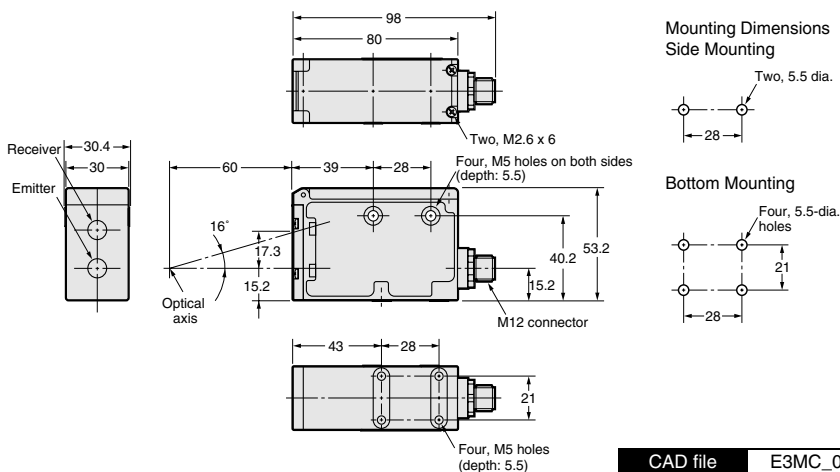
Dimensions (Unit: mm)

Sensors

E3MC-A□□
E3MC-MA□□
E3MC-A81

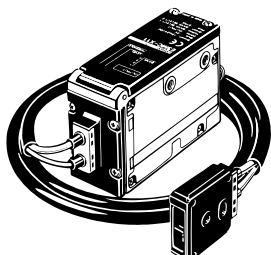


E3MC-A11

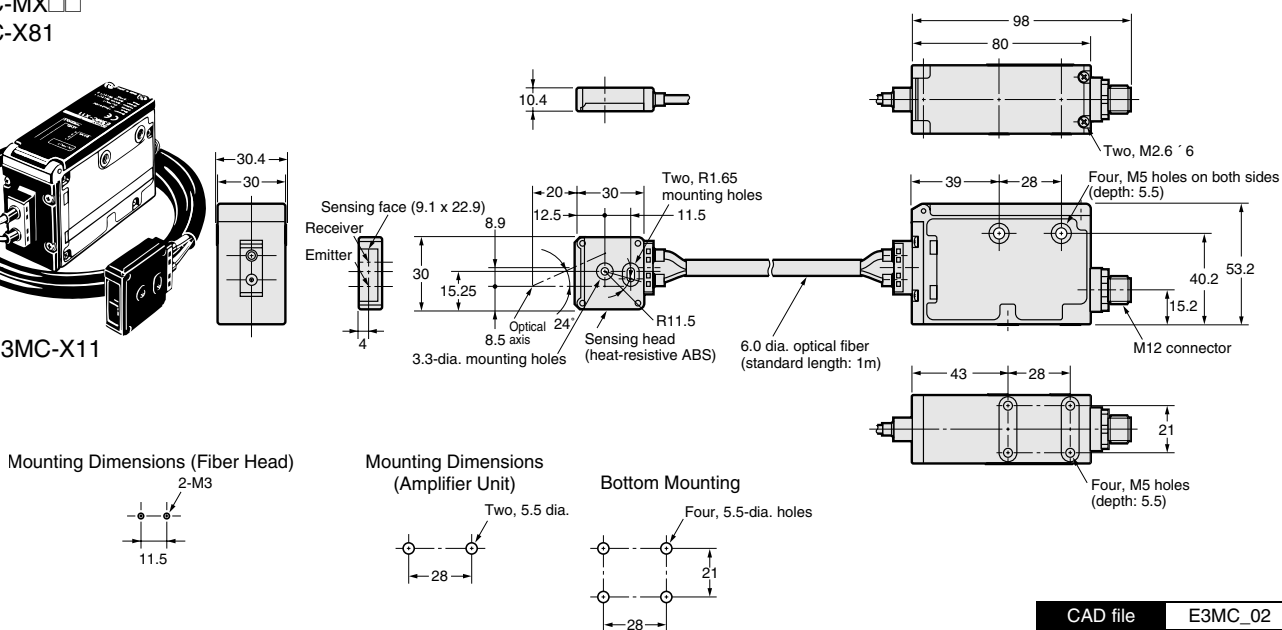


CAD file E3MC_01

E3MC-X□□
E3MC-MX□□
E3MC-X81

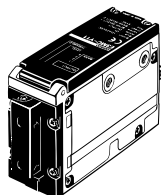


E3MC-X11

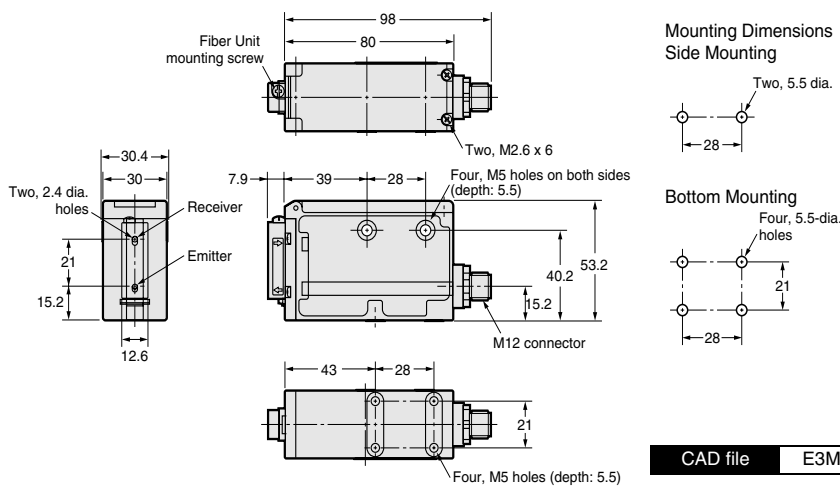


CAD file E3MC_02

E3MC-Y□□
E3MC-MY□□
E3MC-Y81



E3MC-Y11



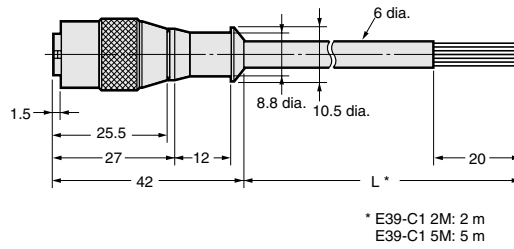
CAD file E3MC_03

Fiber Units

Accessories (Order Separately)

Sensor I/O Connectors

E39-C1 2M (included)
E39-C1 5M



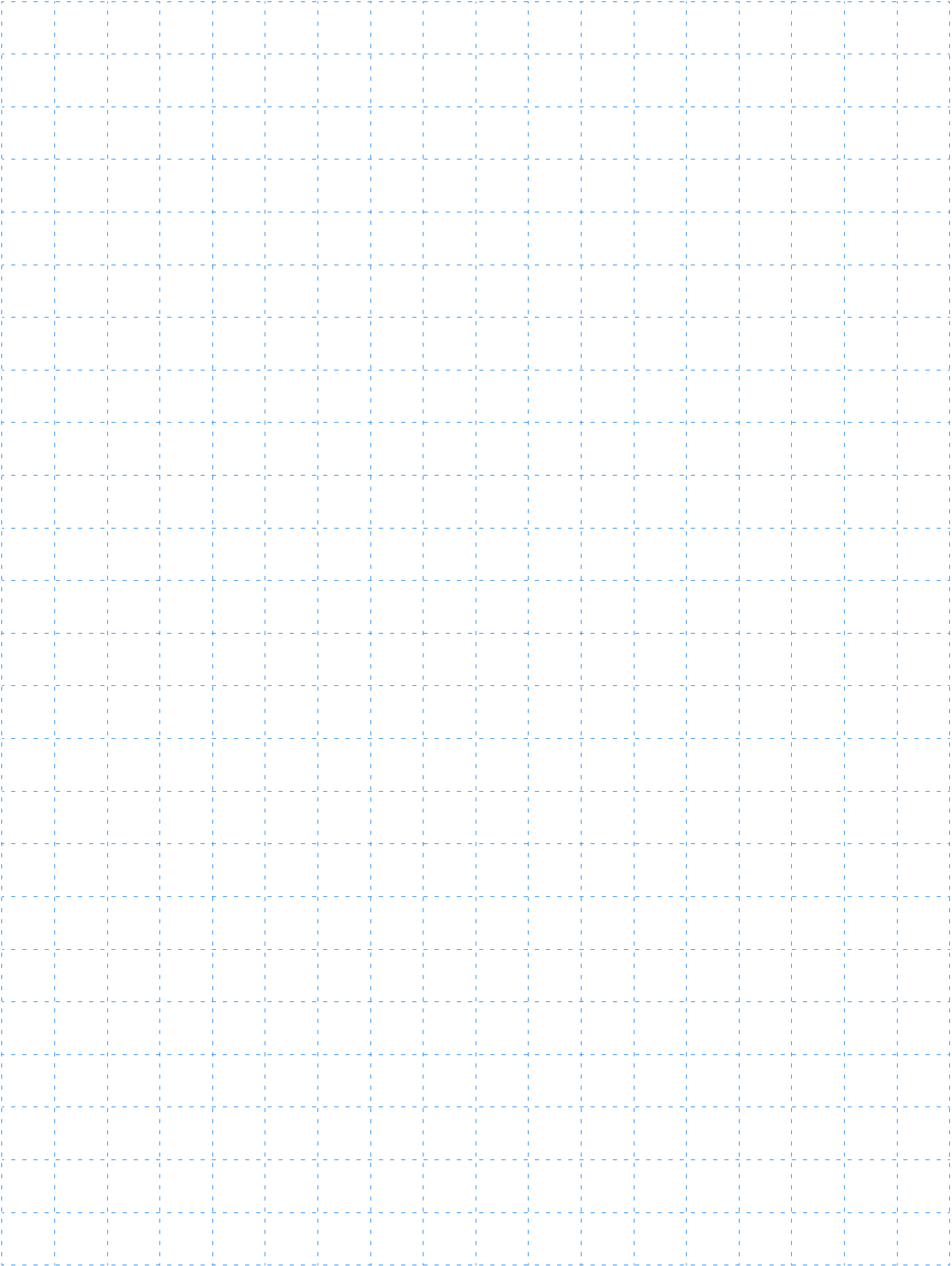
* Attached to the product.

CAD file E39_38

Mounting Brackets

A-314

MEMO



E3MC

Distance setting laser photoelectric sensor

F3C-AL

Even in a reflective background such as SUS, a stable detection of work of any color is possible by simple distance adjustment.

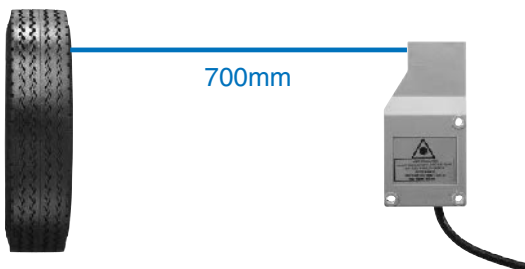


CE

Features

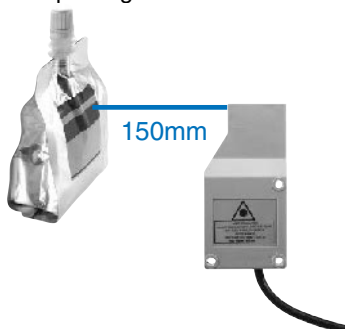
Clear red spot ensures easy setting.

With its wide setting range 150 to 700 mm, F3C-AL is compatible with standard conveyors. In the setting distance of 700 mm, the distance can be set easily with a 1.5x4 mm red spot.



Secure detection of shiny surface

Ensures stable detection of a 45-degree shiny surface. Detection of pouches, laminated packages or like minimizes setup change time.



Unaffected by a shiny background.

Insensitive to shiny objects in the background, the Sensor can be installed in any place.

Small Black/White error:

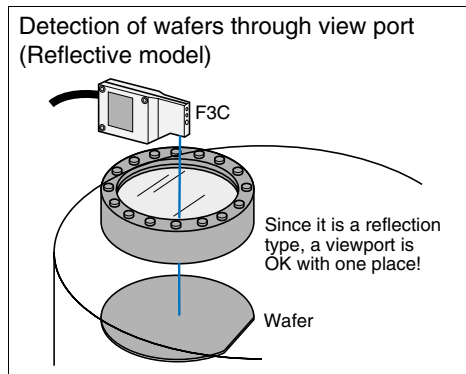
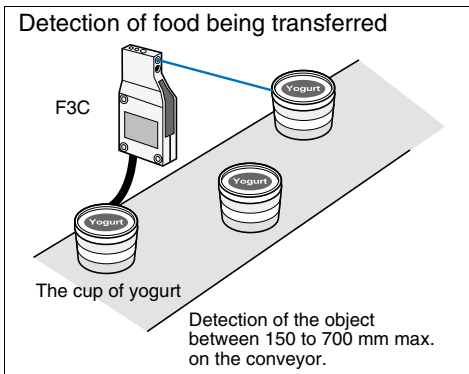
1% (Setting distance 300 mm),
3% max. (Setting distance 500 mm)

A little black/white error saves adjustment time during setup change.

Full hysteresis detection range 0.5% max. (for white paper)

6-turn adjuster ensures ease of adjustment.

Application



Ordering Information

Sensors

Red light

Shape	Connection method	Sensing/Setting range	Operating mode	Model	
				NPN output	PNP output
	Pre-wired with M12-connector	120 150 700 mm Setting range Sensing distance 120 to 700 mm	Light-ON/Dark-ON cable connection selectable	F3C-AL14-M1J	F3C-AL44-M1J

Accessories (Order Separately)

Mounting Brackets

Shape	Model	Quantity
	E39-L40	1

Sensor I/O Connectors

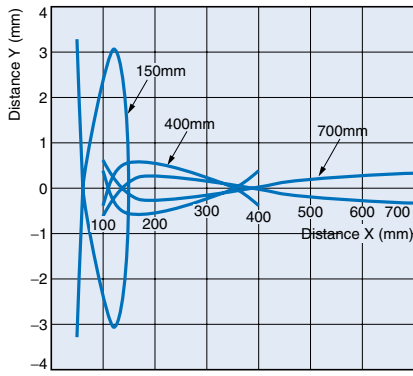
Cable specifications	Shape	Cable type		Model
Standard cable	Straight type	2 m	4 conductors	XS2F-D421-D80-A
		5 m		XS2F-D421-G80-A
	L type	2 m		XS2F-D422-D80-A
		5 m		XS2F-D422-G80-A
Robot cable (for vibration resistance)	Straight type	2 m		XS2F-D421-D80-R
		5 m		XS2F-D421-G80-R
	L type	2 m		XS2F-D422-D80-R
		5 m		XS2F-D422-G80-R

Rating/performance

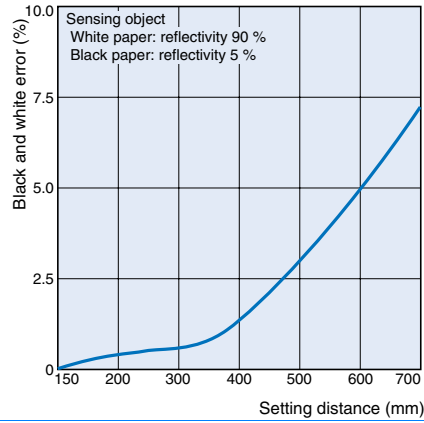
Item	Model	F3C-AL14-M1J	F3C-AL44-M1J
Sensing		120 to 700 mm (White paper 100 x 100 mm) (Setting distance 700 mm)	
Setting range		150 to 700 mm (White paper 100 x 100 mm)	
Spot Diameter		1.5 x 4 mm (Setting distance 700 mm)	
Photoelectric (light emission wavelength)		Semiconductor laser diode (red) (670 nm) JIS Class 2	
Power supply voltage		10 to 30 VDC [ripple (p-p) 10% included]	
Current consumption		30 mA max.	
Control output		Load supply voltage 30 VDC max., load current 150 mA max. (residual voltage: 2 V max.) NPN open collector output type, Light-ON/Dark-ON cable connection selectable	Load supply voltage 30 VDC max., load current 150 mA max. (residual voltage: 2 V max.) PNP open collector output type, Light-ON/Dark-ON cable connection selectable
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention	
Response time		Operation or reset: 10 ms max.	
Sensitivity adjustment		6-turn adjuster	
Ambient illuminance		Incandescent lamp/Sunlight: 5,000 lux max.	
Ambient temperature		Operating: 0°C to 40°C, Storage: -25°C to 60°C (with no icing or condensation)	
Ambient humidity		Operating/Storage: 35% to 85%RH (with no condensation)	
Insulation resistance		20 M Ω min. at 500 VDC	
Vibration resistance		10 to 55 Hz double amplitude 1.5 mm or 300 m/s ² for 2 h in each of X, Y, Z directions	
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions	
Protective structure		IEC Standard IP40	
Connection method		M12 connector joint type (standard cable length 200 mm)	
Weight (packed state)		Approx. 80 g	
Material	Case	ABS	
	Lens	Acrylics	
Accessories		Adjusting screwdriver, Laser warning label, instruction manual	

Characteristic data (typical)

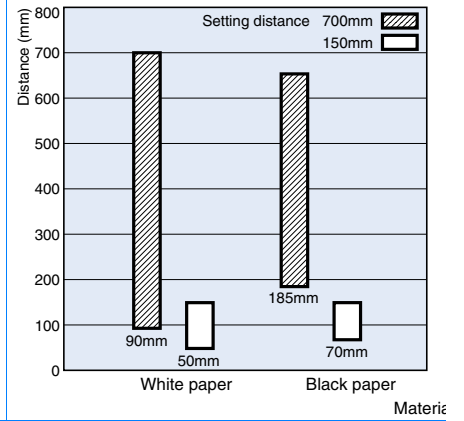
Parallel operating range



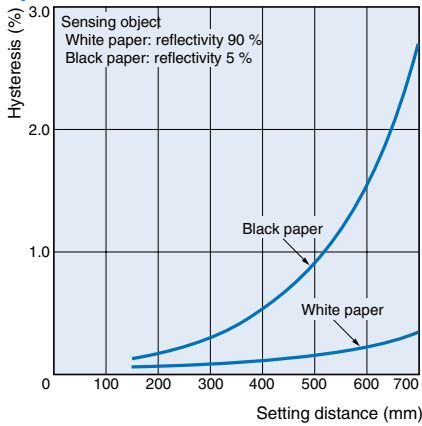
Black/White error



Short distance characteristic chart



Hysteresis



Output Circuit Diagram

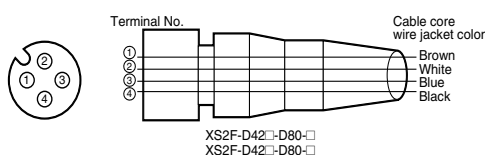
NPN output

Model	Operating status of output transistor	Timing chart	Cable connection	Output circuit
F3C-AL14-M1J	Light ON		Connect ② to ① or disconnect ②.	<p>Connector Pin Arrangement</p>
	Dark ON		Connect ② to ③.	<p>Connector Pin Arrangement</p>

PNP output


Model	Operating status of output transistor	Timing chart	Cable connection	Output circuit
F3C-AL44-M1J	Light ON		Connect ② to ① or disconnect ②.	<p>Connector Pin Arrangement</p>
	Dark ON		Connect ② to ③.	<p>Connector Pin Arrangement</p>

Connectors (Sensor I/O connectors)



Class	Wire, outer	Connector	Application
For DC	Brown	①	Power supply (+V)
	White	②	Operation switching
	Blue	③	Power supply (0 V)
	Black	④	Output

Precautions

 Warning

Be careful not to expose your eyes directly to the laser beam or to the light reflected by a mirror-smooth object.

The laser beam emitted from the laser has high power density and its entry to your eyes may cause blindness.



Laser safety

The laser safeguards have been stipulated for laser equipment in and outside Japan. The following gives brief description for use in Japan.

The JIS C6802 Standard stipulates safety preventives that must be taken by the user according to the laser product class. (The outline is given in the following table.)

User's Requirements

Class Item	Class 1	Class 2	Class 3A	Class 3B		Class 4
				3B*	3B	
Using remote interlock		Not required				Connect the remote interlock of the laser beam to the emergency main interlock, the interlock of the room, or the interlock of the door.
Key control		Not required				Do not keep the key in the lock when the laser beam is not used.
Beam breaker or attenuator		Not required				Used to protect people from accidental radiation by the laser beam.
Warning sign		Not required				Post a proper warning sign on the door to the room where laser beam equipment is installed.
Beam path	Not required	The laser beam must be terminated and, as a rule, must be enclosed. If the laser beam is exposed, the vertical height of the beam must not be the same as that of the eyes.				
Mirror reflection		Not required				Appropriate optical elements must be securely attached and you must be able to control the optical elements during laser radiation.
Eye protect		Not required				Use eye protectors except in special, specified locations.
Protection clothes	Not required					Wear protection clothes if exposure of the skin to the laser beam may exceed the MPE of the skin.
Training	Not required					The laser system must be operated by only properly trained people.

* 5 mW or less in the visible range

Classification of F3C

Class 2

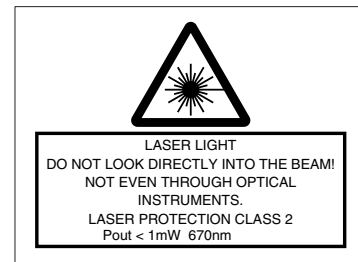
Handle laser equipment in accordance with the following precautions.

- Do not look into the beam.
- Do not disassemble the product. Doing so will release the laser beam to wander around.

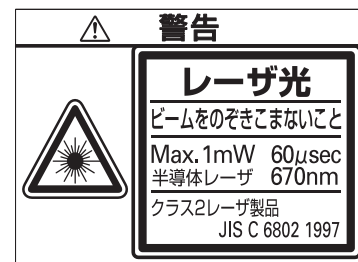
Please obtain or prepare the "Laser product safety standards" on your own responsibility.

Labels related to laser

The following warning label is applied to the side face of the photoelectric sensor.



For use in Japan, change the above label for the one that meets the JIS Standards.



Handling Instructions

F3C radiates a visible-light laser. Do not look into it directly. Use F3C so that the light path of the laser beam is terminated. If there is a mirror-smooth reflector in the light path, confine the beam away from the reflected light path. If F3C must be used with the light path open, avoid placing the light path on the eye level.

Correct Use

Design

Power Reset Time

The Photoelectric Sensor is ready to sense an object in 300 ms after power-on. Therefore, use it 300 ms after power-on. If the load and Sensor are connected to different power supplies, always switch on power for the Sensor first.

Wiring Considerations

Load short-circuit protection

- The F3C-AL has load short-circuit protection. If a load short-circuit or like has occurred, the output turns OFF. Therefore, recheck the wiring and switch power on again. This resets the short-circuit protection circuit. Load short-circuit protection is activated when a current of 1.8 times or more of the rated load current flows. When using an L load, use the one the inrush current of which is less than 1.8 times of the rated load current.
- Do not use the input power exceeding the rated voltage. Doing so can cause damage.
- Do not shorten the load with the open collector output. Otherwise, damage might be caused.
- Run the wiring of F3C separately from the high voltage and power cables.
- Avoid wiring them together or running them within the same duct. Doing so may get them induced, causing a malfunction or damage.
- For extension of the cable, use a 0.3-mm² or more cable and run it within 50 m.

Mounting

- Install the photoelectric sensor so that the sun, fluorescent lamp, incandescent lamp or any other strong light will not enter the directional angle range of the sensor.
- If Sensors are installed face-to-face, ensure that no optical axes cross each other. Otherwise, mutual interference may result.
- Use M4 screws to mount the unit.
- When mounting the case tighten it to the torque of 1.2 Nm max.

Miscellaneous

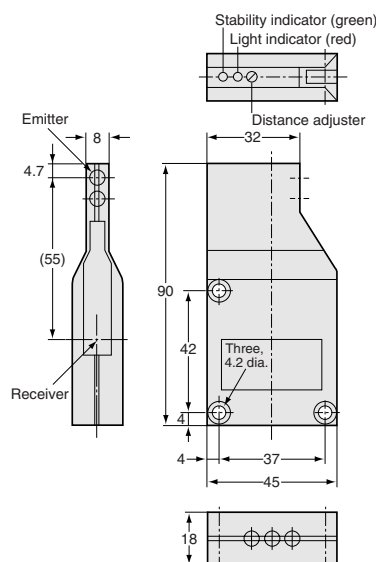
Operating Environment

- Avoid using the Sensor in a strong disturbance light (e.g. laser beam or arc welding beam) or strong electromagnetic field.
- Depending on their material and/or shape, some objects may not be detected or may be detected with low accuracy. (Mirror-smooth material, transparent material, material of extremely low reflectivity, object smaller than spot diameter)

Dimensions (Unit: mm)

Sensors

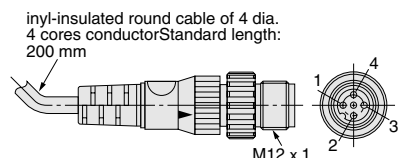
F3C-AL14-M1J
F3C-AL44-M1J



CAD file F3C_01

Terminal No.	Specifications
1	+V
2	L-ON/D-ON selection
3	0V
4	Output

Note. L-ON when 1-2 are connected
D-ON when 2-3 are connected

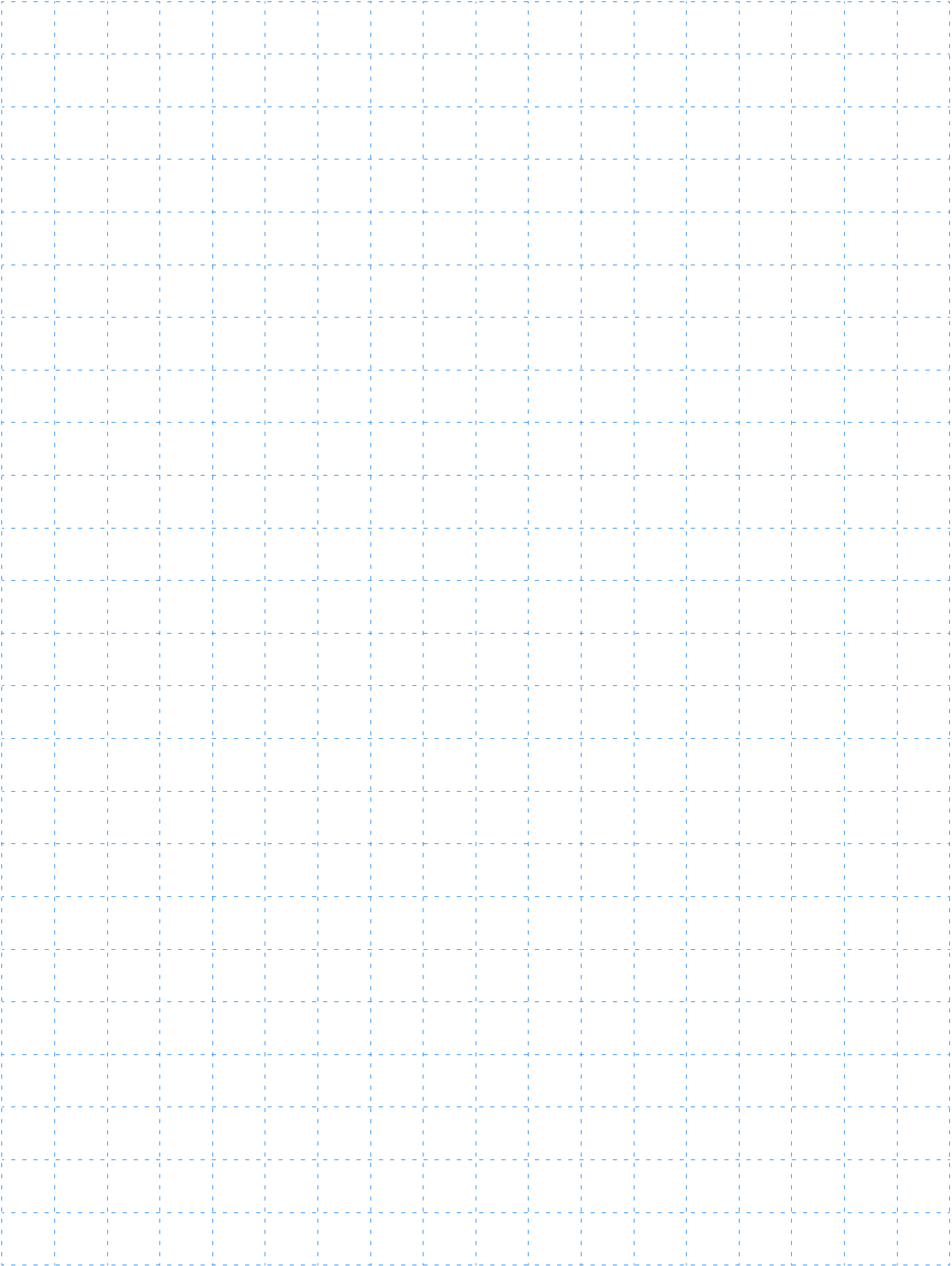


Accessories (Order Separately)

Mounting Brackets

A-314

MEMO



F3C-AL

Optical Fiber Glossy Object Sensor

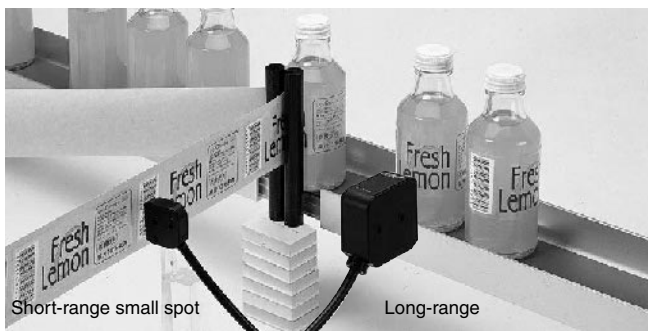
E3X-NL

Utilization lightwave technology has innovated glossiness detection. OMRON's glossy object sensor can discriminate a wide variety of glossiness differences. The fiber-optic system has achieved the small, non-contact models.



Features

Employs OMRON's unique FAO (Free Angle Optics) technology which enables delicate sensing of object glossiness without influence from colors and patterns. Transparent films on boxes and labels on transparent films can be detected.



Two different types of fiber heads meet a wide range of applications.

Two different fiber heads are available.

According to applications, you can choose the short-distance, small spot type ideal for detection of small objects or the long-distance type that can perform in-line standard detection.

Short-distance, small spot type

E32-S15-1/-2
Ideal for precision detection and small object detection.

Long-distance type

E32-S15L-1/-2
Resistant to object shake and enables in-line standard detection.



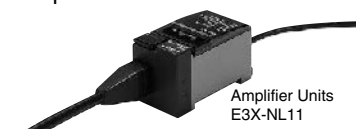
The teaching system ensures easy adjustment just by pressing the button.

- Adjustment man-hour saving type requiring only a one-time pressing of the button
- Teaching system only requires to push the button, ensuring sensitivity adjustment without individual differences.



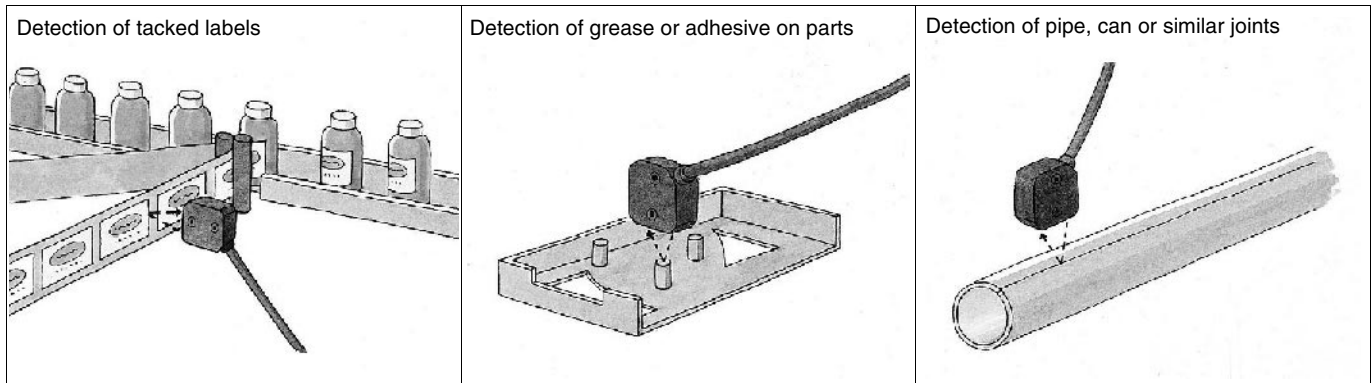
Adopts the pulse-ON system that is insensitive to disturbance light

The emitter (red LED) in the fiber head uses a pulse-ON system to minimize the influence of disturbance light. The Sensor provides stable sensing characteristics if disturbance light occurs from fluorescent lamps in-line.

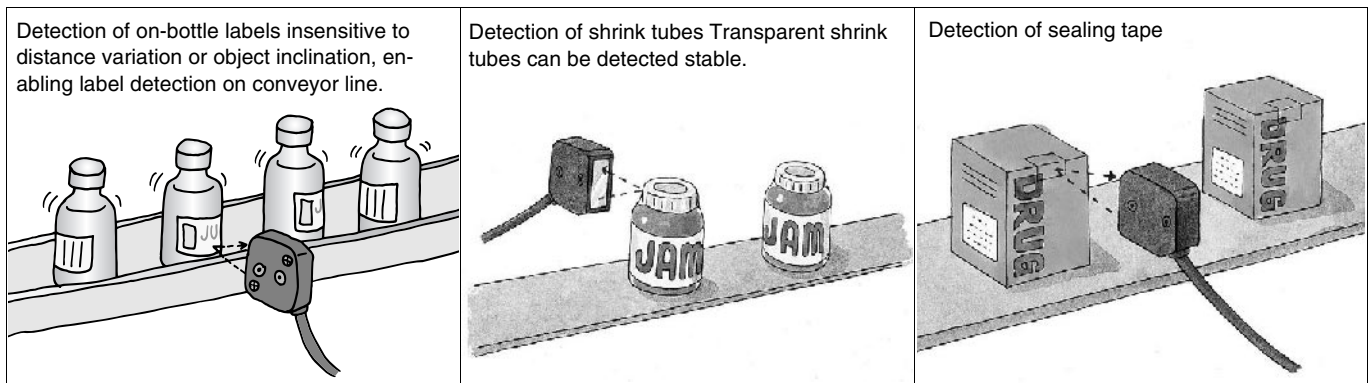


Application

Short-distance, small spot type



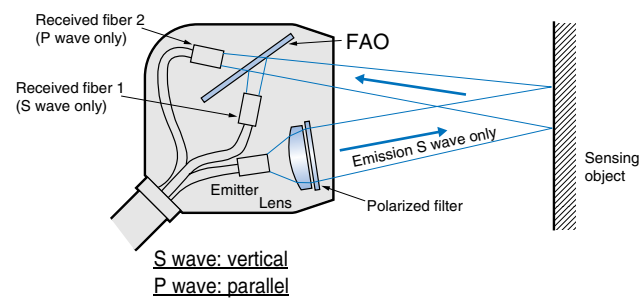
Long-distance type



Features

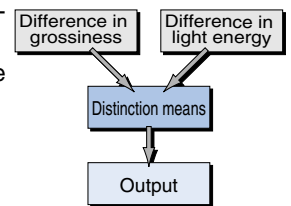
Principles for Glossiness Detection by FAO

First, the light from a red LED passes through a polarizing filter so only the S wave is emitted. If the detectable object is glossy, the S wave is reflected regularly and is transmitted as is to the Fiber Receiver 1. If the detectable object is not glossy, there is more diffuse reflection, thus the polarization direction is randomized and a P wave is generated. The S and P waves are divided by the FAO (special polarized beam splitter), the waves travel to their respective fiber receivers, and the variation in the glossiness is determined by comparing the two received signals.



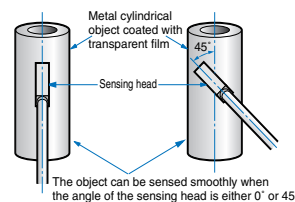
Fuzzy Teaching Function Backs up Stable Detection

Supported by the fuzzy teaching function if objects have no difference in glossiness. If the glossiness difference goes below than the minimum sensing level, the microprocessor in the amplifier determines the discrimination means automatically. Sensed by light energy difference like an ordinary mark sensor. (When 2-point teaching is selected)



Measures against Double Refraction

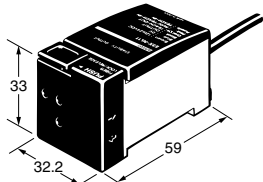
There are transparent films and transparent plastic objects that change the direction of polarized light when it passes through the transparent films and transparent plastic objects. This is called double refraction. Using the optional rotary mounting bracket (E39-L109), the sensor unit can be inclined 45 degrees to take measures against double refraction. (Example) Metal cylindrical object coated with transparent film



Ordering Information



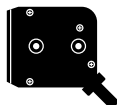

Sensors

Amplifier Units

Connection method	Shape	Model
Pre-wired type		E3X-NL11

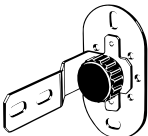
Fiber Units

 Red light

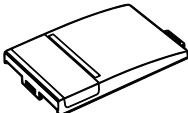
Sensor type	Shape	Sensing distance	Fiber length	Model
Reflective model		 10 ± 3 mm	0.5 m	E32-S15-1
			1 m	E32-S15-2
		 20 ± 7 mm	0.5 m	E32-S15L-1
			1 m	E32-S15L-2

Accessories (Order Separately)

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L109	1	Can be used with the fiber unit E32-S15-□. Mounting bracket variable in rotary angle (0°, 45°) for stable detection of transparent films (double-refractive objects) on glossy objects such as metal or glass plates.

Covers

Shape	Model	Quantity	Remarks
	E39-G9	1	Attached to the amplifier unit E3X-NL11. Please place an order when the protective cover is damaged or lost.

Rating/Performance

Amplifier Units

Item	Model	E3X-NL11
Light source (wave length)		Red LED (680 nm)
Power supply voltage		12 to 24 VDC \pm 10%, ripple (p-p) : 10% max.
Current consumption		100 mA max.
Control output		Load supply voltage 30 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (NPN output) Light-ON/Dark-ON switch selectable
Answer-back output		Load power supply voltage 30 VDC max., load current 100 mA max. (residual voltage 1 V max.) Open collector output type (NPN output)
Remote teaching input		Purple and blue (0 V) are connected when remote input turns ON: 0 V short-circuit current 1 mA max. Purple and blue (0 V) are disconnected when remote input turns OFF: Open or 9 V min. (max. input voltage 24 V). Note that the input is valid only when remote RUN/TEACH selection input (across pink-blue) is provided.
Protective circuits		Protection from load short-circuit and reversed power supply connection
Response time		Operation or reset: 1 ms max.
Sensitivity adjustment		Teaching system
Timer function *		OFF-delay fixed at 40 ms
Ambient illuminance		Incandescent lamp: 3,000 lux max. Sunlight 10,000 lux max.
Ambient temperature		Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)
Insulation resistance		20 M Ω min. at 500 VDC
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute
Vibration resistance		10 to 55 Hz, 1.5-mm double amplitude or 300 m/s ² (approx. 30G) for 2 hrs each in X, Y, and Z directions
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions
Protective structure		IEC 60529 IP50 (with Protective Cover attached)
Connection method		Pre-wired models (standard length: 2 m)
Weight (Packed state)		Approx. 200 g
Material	Case	PBT (polybutylene terephthalate)
	Cover	Polycarbonate
	Mounting Brackets	Stainless steel (SUS304)
Accessories		Mounting bracket, instruction manual

* The OFF-delay timer can be reset by setting the switch.

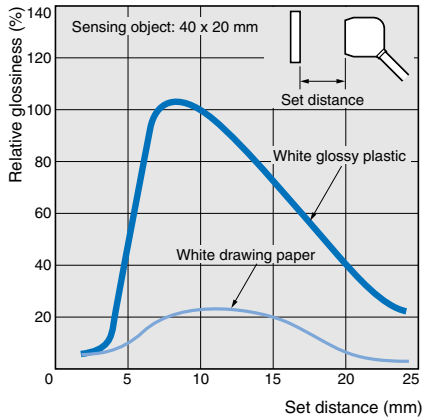
Fiber Units

Item	Sensing method Features Model	Reflective model			
		Short-range small spot		Long-range	
		E32-S15-1	E32-S15-2	E32-S15L-1	E32-S15L-2
Sensing distance		10 \pm 3 mm (white paper, white glossy plastic 40x20 mm)		20 \pm 7 mm (white paper, white glossy plastic 40x20 mm)	
Min. sensing object		0.5-mm		2-mm	
Sensing object angle		Glossiness determination is possible at \pm 4° inclination from the mounting hole (at sensing distance of 10 mm)		Glossiness determination is possible at \pm 7° inclination from the mounting hole (at sensing distance of 20 mm)	
Spot diameter		Approx. 2-mm dia./approx. 2-mm dia. (at sensing distance of 10 mm)		Approx. 15-mm dia./approx. 4-mm dia. (at sensing distance of 20 mm)	
Ambient temperature		Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)			
Ambient humidity		Operating: 35% to 85%RH, Storage: 35% to 90% RH (with no condensation)			
Permissible bending radius		4 mm min.			
Protective structure		IEC 60529 IP50			
Fiber length		500 mm	1 m	500 mm	1 m
Weight (Packed state)		Approx. 50 g	Approx. 60 g	Approx. 80 g	Approx. 90 g
Material	Sensor case	Heat-resistant ABS resin			
	Sensor window	transparent glass		Acrylics	
	Fiber cladding	urethane			

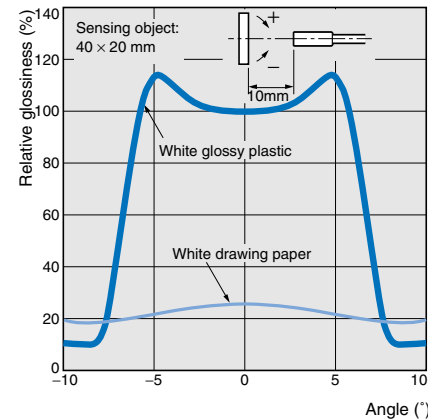
Characteristic data (typical)

Glossiness vs. Operating Range (Typical) Glossiness vs. Angle (Typical)

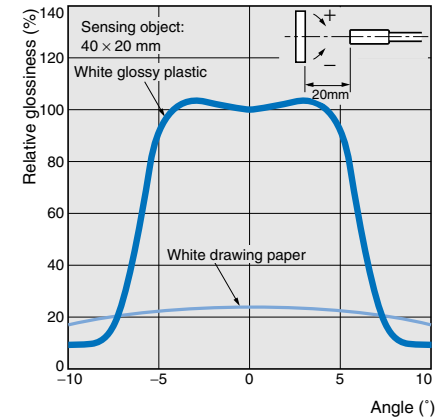
E3X-NL11 with E32-S15-□



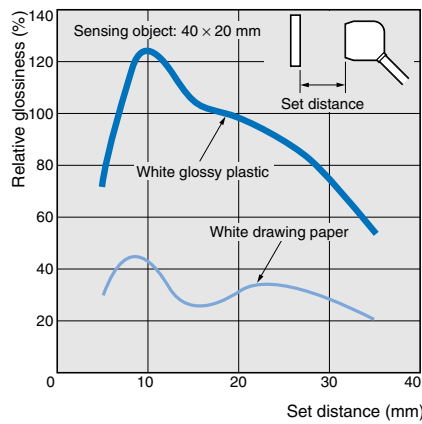
E3X-NL11 + E32-S15-□ (X direction)



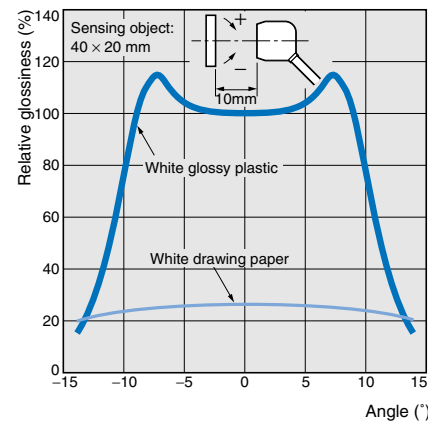
E3X-NL11 + E32-S15L-□ (X direction)



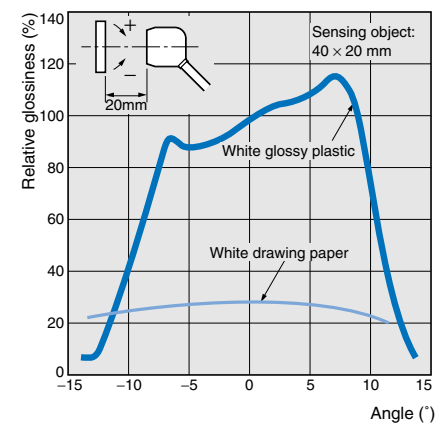
E3X-NL11 with E32-S15L-□



E3X-NL11 + E32-S15-□ (Y direction)



E3X-NL11 + E32-S15L-□ (Y direction)



Output Circuit Diagram

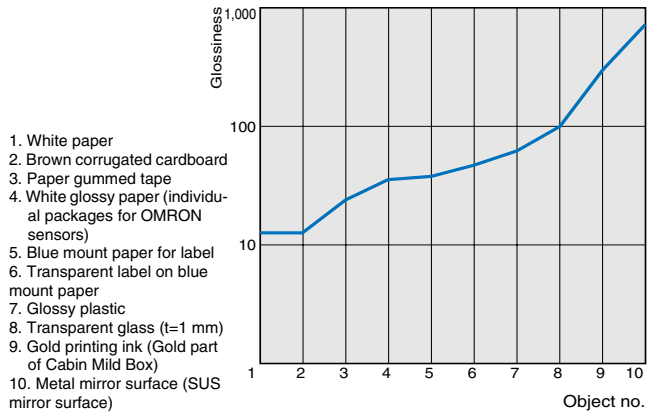
NPN output

Model	Output transistor Status	Timing chart	Mode selection switch	Output circuit
E3X-NL11	Light ON	<p>T: OFF delay timer The change for 0 or 40ms (fixed) is possible.</p>	L•ON	
	Dark ON	<p>T: OFF delay timer The change for 0 or 40ms (fixed) is possible.</p>	D•ON	

Technical Guide

Glossiness

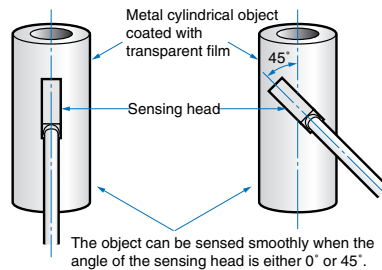
When light is applied to the sensing object, the reflected light is generally a mixture of regular reflection components and diffuse reflection components. Glossiness is directly proportional to the light intensity of the regular reflection components. In JIS, the glossiness of a glass plate surface having 1.567 reflectivity is defined 100 as the basis of glossiness. Glossiness of Typical Object Sensed by E3X-NL11 + E32-S15



Sensing of Transparent Objects with Rotating Fiber Unit Mounting Bracket

There are transparent films and transparent plastic objects that change the direction of polarized light when it passes through the transparent films and transparent plastic objects. When E3X-NL senses these transparent films and transparent plastic objects on glossy background objects, such as glossy paper or metals, E3X-NL will not sense these objects smoothly in case of an incorrect angle of the sensor head. The most suitable angle of the sensor head varies with the transparent object. The angle of the sensor head can be, however, 0° or 45° for the smooth sensing of such transparent objects due to the characteristic of polarized light. There is no need for the angle to be midway between 0° and 45°. E39-L109, which is sold separately, is a mounting bracket that rotates to angles of 0° or 45° and enables E3X-NL to sense such transparent objects smoothly with its sensing head set at 0° or 45° without changing the sensing positive.

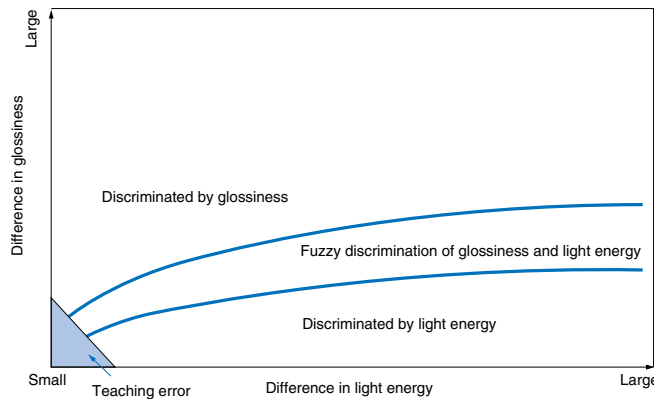
(Example) Metal cylindrical object coated with transparent film



Fuzzy Teaching Function

E3X-NL in two-point teaching operation will perform fuzzy computation using the difference in glossiness and the difference in light energy between the two teaching points to determine the thresholds setting with E3X-NL. As shown in the following table, if there is only a small difference in glossiness but there is a large difference in light energy between the two teaching points, the thresholds set with E3X-NL will be determined by the light energy values.

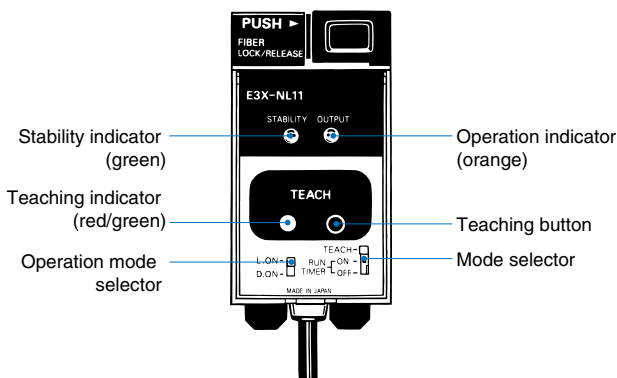
Taught Difference in glossiness between two teaching points	Taught Difference in light energy between two teaching points	Discriminating method
Large	Large	Discriminated by glossiness.
Large	Small	Discriminated by glossiness.
Small	Large	Discriminated by light energy.
Small	Small	Discriminated by glossiness. A teaching error will result if the difference in glossiness and that in light energy are both less than the sensing levels of E3X-NL.



Countermeasures against Teaching Errors Resulted with Transparent Labels on Sheets

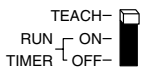

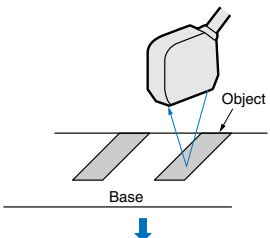

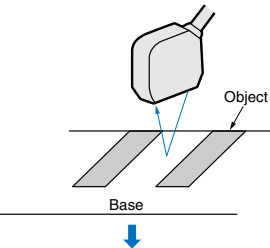
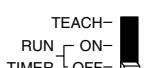

The material of the sheets must not be too glossy.

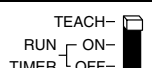
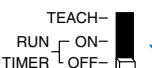

Nomenclature:



Operation

Sensitivity setting

Two-point teaching		
Proce-dur e	Setting	Operation
1	---	Locate the sensor head within the sensing distance.
2		Move the mode selector to the TEACH position.
3	 	Press the teaching button once with a sensing object located under the sensor as shown in the following illustration. Teaching indicator ... Lit red The built-in buzzer beeps once.
4	 	With an object absent (ground), press the TEACHING button (second time). If teaching is OK Teaching indicator ... Lit red → Lit green The built-in buzzer beeps once. If teaching is NG Teaching indicator ... Lit red → Flickers red The built-in buzzer beeps 3 times. Change the object position and setting distance again and make setting in order of 1 to 4.
5		Move the mode selector to the RUN position. Sensitivity setting is complete. Teaching indicator ... Lit green → Extinguished
6		Light Dark Select the desired operation format with the operation mode selector (L.ON/D.ON).

One-point teaching		
Proce-dur e	Setting	Operation
1		Move the mode selector to the TEACH position.
2		Press the teaching button with one of the sensing objects or the background object located under the sensor for sensing. ↓ Teaching indicator ... Lit red The built-in buzzer beeps once.
3		Move the mode selector to the RUN position. 1-point teaching setting is complete as soon as the first object passes. Teaching indicator ... Lit red → Lit green
4		Select the desired operation format with the operation mode selector (L.ON/D.ON).

Precautions

Correct Use

Fiber Units

Installation

Tightening Force

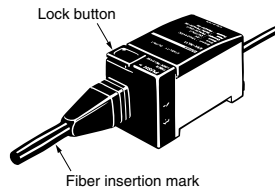
For the fiber unit installation, tighten it to the torque of 0.3 Nm max.

Fiber Connection and Disconnection

E3X-NL amplifier has a push lock. Connect or disconnect the fibers to or from E3X-NL amplifier using the following procedures:

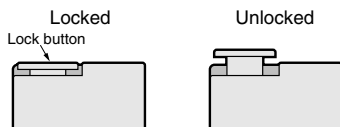
1. Connection

After inserting the fiber into the Amplifier, push the lock button until a click sound is heard so that the fiber is securely connected.



2. Disconnection

Ensure to press the push lock again to unlock before pulling out the fiber, otherwise the fiber may be deteriorated. (To maintain the fiber characteristics, remove the fiber after making sure that the lock has been released.)



3. The fiber must be locked or released in a temperature range of -10° to 40°.

Since face-to-face installation of the fiber units may cause mutual interference, mount them so that the optical axes of the sensors are not opposed.

Mounting the sensor

If two or more sensors are used, face-to-face installation of the fiber units or the regularly reflected light from the sensing object may cause mutual interference. At this time, adjust the fiber units to be mounted at the angles where the light of each sensor is not received by the fiber unit of the other sensor.

● For adjustment

Two-point Teaching and One-point Teaching

Refer to the following information to select the most suitable sensitivity setting method for the application.

Sensitivity setting method	Two-point teaching	One-point teaching
Difference	In general, use 2-point teaching. The fuzzy teaching function (refer to Technical Guide) is activated to set the optimum algorithms automatically, drawing an operation level just about between the two points taught.	One-point teaching should be performed for the sensing of different objects on a single background object or a single type of objects on a variety of glossy background objects. The operating level will be set 15% above or below the teaching point, depending on the glossiness of the first sensing object. The fuzzy teaching function is not activated for 1-point

Selection of Teaching Point(s)

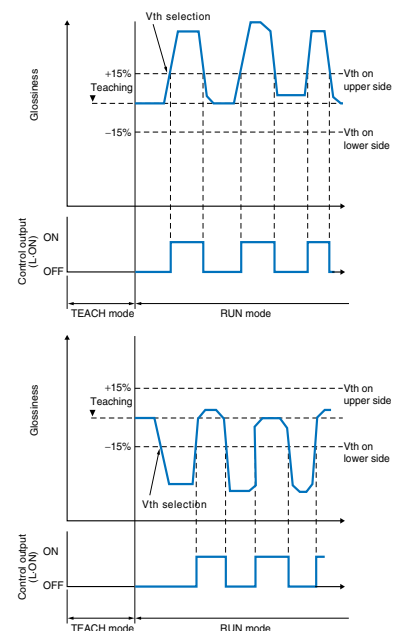
Two-point Teaching

If E3X-NL is used to sense sensing objects that are only a little different in glossiness from the background object and the sensing objects have color patterns, the difference in glossiness among the inks on the sensing objects may influence the sensing operation of E3X-NL. Therefore perform two-point teaching with E3X-NL at a place where E3X-NL can sense the sensing objects smoothly while considering the characteristics of glossiness versus distance of E3X-NL if the sensing position of each of the sensing objects is different from each other.

One-point Teaching

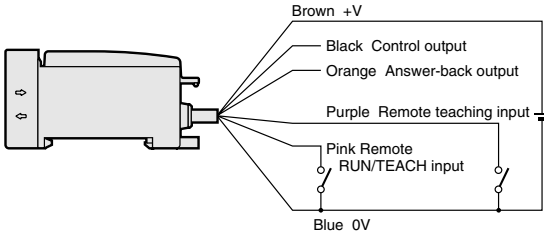
If E3X-NL is used to sense sensing objects different from each other in glossiness on a single background object, perform one-point teaching with E3X-NL using the background object. If E3X-NL is used to sense identical sensing objects on a variety of glossy background objects, perform one-point teaching with E3X-NL using one of the sensing objects.

Operation Level Setting and Control Output for One-point Teaching

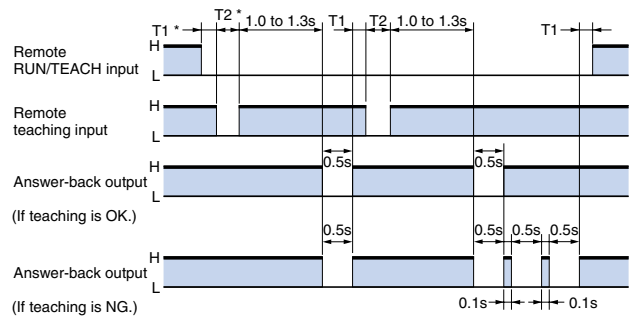


Remote teaching function

In remote teaching, the remote RUN/TEACH input signal is used for teaching instead of the mode selector and the remote teaching input signal is used instead of the teaching button.

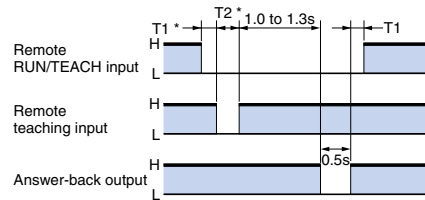
Procedure	Operation
1	Set the mode selector to RUN .
2	<p>The following signal conditions must be given as remote teaching input conditions.</p>  <ol style="list-style-type: none"> ① If there is a teaching error after performing remote two-point teaching with E3X-NL, try performing remote two-point teaching again. If the remote RUN/TEACH input is set from L to H after the teaching error, the thresholds set with E3X-NL will not be refreshed. ② When remote teaching is not performed, cut the pink and purple wires at the root of the cable or connect them to the + side (+V) of the power supply, and cut the orange wire at the root of the cable or connect it to GND (0 V). ③ About 1 s after remote teaching is over, the Sensor is made ready to detect an object.

(Remote 2-point teaching)



* Note: T1 must be 20 ms minimum and T2 must be 500 ms minimum at the time of remote teaching.

(Remote 1-point teaching)



Miscellaneous

EEPROM Write Error

If a write error occurs (buzzer beeps, red and green teaching indicators flicker at the same time, operation and stability indicators flicker) due to power-off, static electricity or other noise in the teaching mode (until the initial operation level compensation completion of teaching without object), perform teaching again with the unit button.

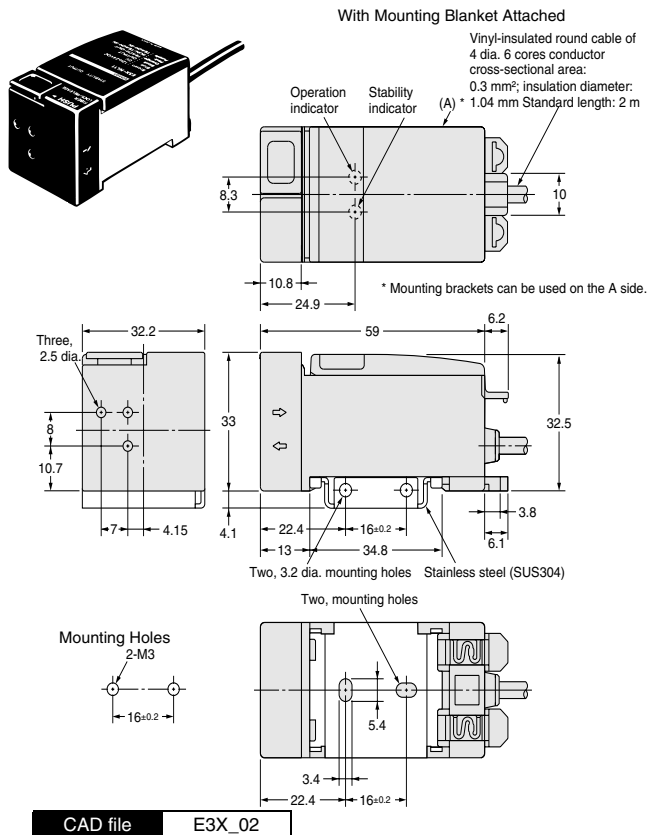
Note: If a memory error occurs, the red and green teaching indicators flicker at the same time and the stability indicator flickers, unlike the teaching error.

Dimensions (Unit: mm)

Sensors

Amplifier Units

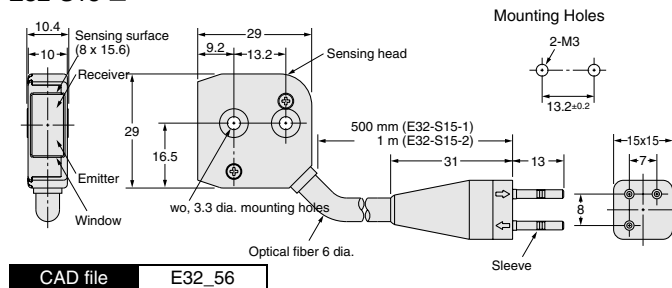
E3X-NL11



Fiber Units

Short-distance, small spot type

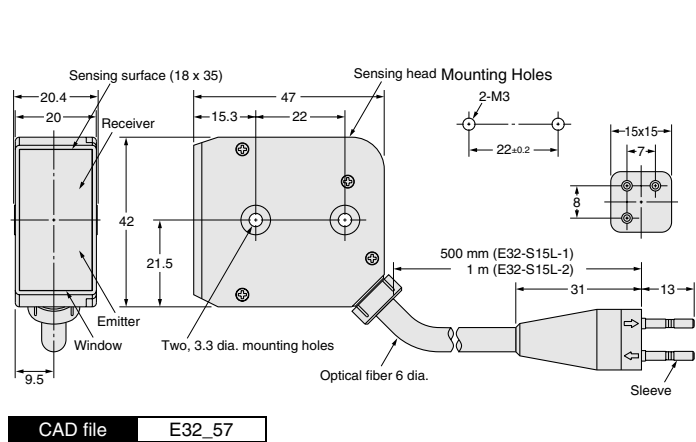
E32-S15-□



Fiber Units

Long-distance type

E32-S15L-□



Accessories (Order Separately)

A-314

Transparent bottle sensor

E3S-CR62/67

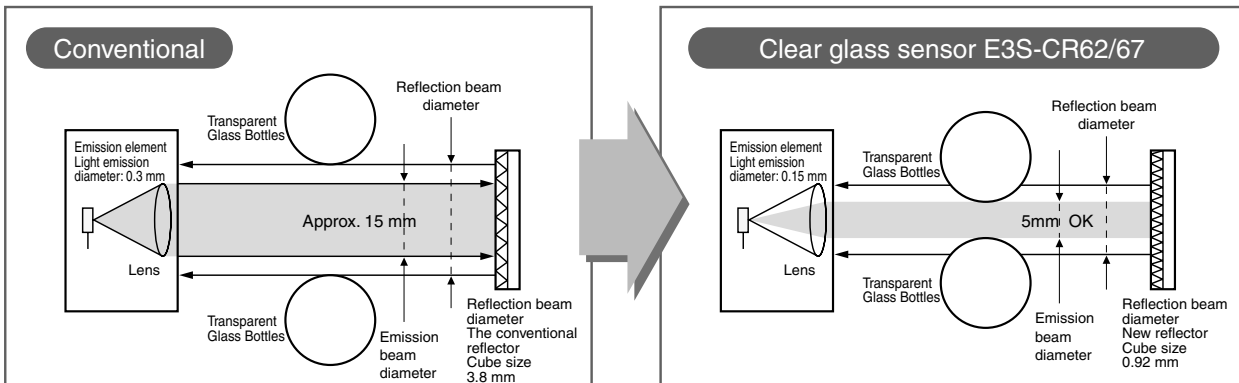
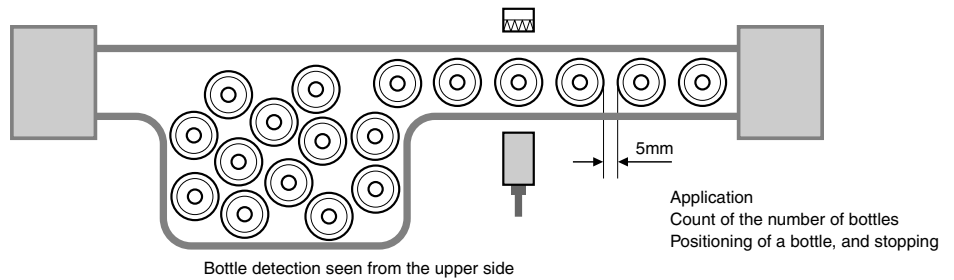
Ideal for detecting transparent glass and plastic containers



Features

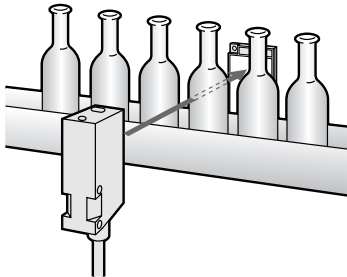
Stable operation even if container interval is shortened for higher productivity.

Stable detection of 5 mm gaps that previous regression reflection models were unable to detect because of a speed increase for higher productivity.

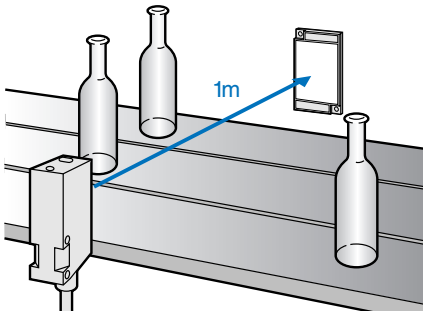


Application

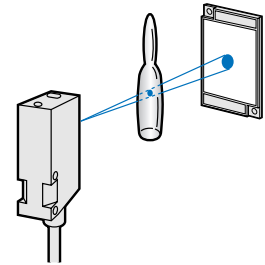
Narrow pin interval detection
Stable detection of 5 mm gaps that are not detectable by previous regression reflection models.



Wide detection range. Stable detection even at long distances.
Use of hyper-point LED as light source (1/2 light emission diameter of previous models) enables stable long-distance detection.



Stable detection of ampoules and other small containers.
Visible spotlight for easy adjustment.



Features

We significantly increased the S/N ratio to enable a stable detection of PET bottles and various other transparent containers

Problem 1

NG

Chattering

The Chattering by the angle of a bottle

A state without a transparent bottle

Reflection beam width

Emission beam width

Sensor

Received element

Reflector

Received light

Problem 2

NG

Incorrect operation

A part of emitted light is received.

The increase light by a transparent bottle

Sensor

Emission element

Transparent Glass Bottles

Reflector

Received element

The increase light by refraction of the lens effect of a bottle

Clear glass sensor E3S-CR62/67

Adoption of the coaxial retroreflective model

Stable detection can be carried out also to the transparent bottle of various form and surface states.

A state without a transparent bottle

Received element

Emission beam width

Reflection beam width

Reflector

Corner cube

All the reflected light is received!

Light is certainly intercepted by the transparent bottle.

Sensor

Received element

Transparent Glass Bottles

Reflector

Refraction of the lens effect of a bottle

(Example)

Using E39-R6 (The characteristic in a short distance)

Distance (mm)	E3S-CR62/67 (S/N)	Conventional model (S/N)
100	~1.7	~1.5
150	~1.7	~1.5
200	~1.7	~1.5
250	~1.7	~1.5

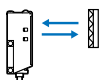
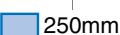

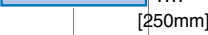
Using E39-R1 (The characteristic in a long distance)

Distance (mm)	E3S-CR62/67 (S/N)	Conventional model (S/N)
200	~1.4	~1.2
400	~1.4	~1.1
600	~1.4	~1.0
800	~1.4	~1.0
1000	~1.4	~1.0

Ordering Information

Sensors

 Red light

Sensor type	Shape	Connection method	Sensing distance		Model
			Reflector E39-R6	Reflector E39-R1	
Retroreflective Models		Pre-wired type	 250mm	 1m *	E3S-CR62-C
		Connector type		 1m [250mm]	E3S-CR67-C

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

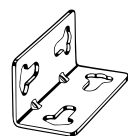
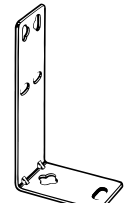
Accessories (Order Separately)

Reflectors



Name	Sensing distance	Model	Quantity	Remarks
Reflectors	250 mm	E39-R6	1	---
	1 m (250 mm) *	E39-R1	1	

* Values in parentheses indicate the minimum required distance between the sensor and reflector.

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L103	1	Supplied with the product.
	E39-L87	1	---

Sensor I/O Connectors

Cable	Shape	Cable length		Model
Standard cable	Straight 	2 m	3-wire type	XS2F-D421-DC0-A
		5 m		XS2F-D421-GC0-A
	L-shape 	2 m		XS2F-D422-DC0-A
		5 m		XS2F-D422-GC0-A

Rating/performance

Item	Sensor type	Retroreflective Models (M.S.R. function)	
	Model	E3S-CR62-C	E3S-CR67-C
Sensing distance	250 mm (When using the E39-R6), 1 m (250 mm)*1 (When using the E39-R1)		
Standard sensing object	30 mm dia. X 150 mm glass tube (thickness: 1.8 mm)		
Directional angle	2 to 6°		
Light source (wave length)	Red LED (660 nm)		
Power supply voltage	10 to 30 VDC, ripple (p-p) : 10 % max.		
Current consumption	40 mA max.		
Control output	Load supply voltage: 30 VDC or less; load current 100 mA or less (residual voltage: NPN output 1.2 V or less, PNP output 2 V or less); open collector model (NPN/PNP output switching) light ON / dark ON switching		
Protective circuits	Load short protection, reverse connection protection, mutual interference protection function		
Response time	Operation or reset: 1 ms max.		
Sensitivity adjustment	2-turn endless adjuster (with indicator)		
Ambient illuminance	Incandescent lamp: 5,000 lux max. Sunlight 10,000 lux max.		
Ambient temperature	Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)		
Ambient humidity	Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)		
Insulation resistance	20 M Ω min. at 500 VDC		
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute		
Vibration resistance	Destruction: 10 to 2,000 Hz, 1.5 mm double amplitude or 300 m/s ² (approx. 30G) for 0.5 hrs each in x, y, and Z directions		
Shock resistance	1000 m/s ² (approx. 100G) 3 times each in X, Y, and Z directions		
Protective structure	IEC Standard IP67 NEMA 6P (restricted to indoor use) *2		IEC Standard IP67 NEMA 6P (restricted to indoor use)
Connection method	Pre-wired models (standard length: 2 m)		Connector type
Weight (Packed state)	Approx. 115 g		Approx. 80 g
Material	Case	Zinc diecast	
	Lens	Acrylics	
	Display operation panel	Polyethyl sulfon	
	Mounting Brackets	Stainless steel (SUS304)	
Accessories	Brackets (with screws), adjustment driver, operation manual		

*1. Values in parentheses indicate the minimum required distance between the sensor and reflector.

*2. NEMA (National Electrical Manufacturers Association) Standard

Output Circuit Diagram

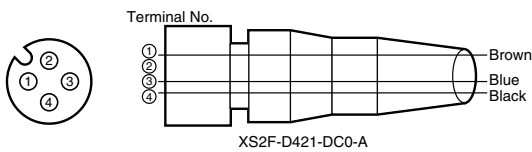
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CR62-C E3S-CR67-C	Light ON		L•ON (LIGHT ON)	<p>* Please make a changeover switch into the NPN side.</p>
	Dark ON		D•ON (DARK ON)	<p>Connector Pin arrangement</p> <p>Note: Pin 2 is not used.</p>

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-CR62-C E3S-CR67-C	Light ON		L•ON (LIGHT ON)	<p>* Please make a changeover switch into the NPN side.</p>
	Dark ON		D•ON (DARK ON)	<p>Connector Pin arrangement</p> <p>Note: Pin 2 is not used.</p>

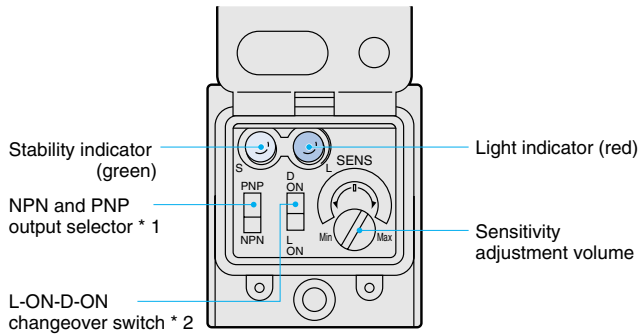
Connectors (Sensor I/O connectors)



Class	Wire, outer	Connector pin	Application
For DC	Brown	①	+V
	-	②	-
	Blue	③	0V
	Black	④	Output

Note: Pin 2 is open.

Nomenclature:



- *1. Output transistor switching is possible by means of NPN/PNP output switch.
- *2. Operation mode can be switched using L•ON/D•ON switch.

Operation

Sensitivity adjustment

The light source switch and reflective plate can be moved horizontally and vertically to set them in the center of the illumination area of the red incident light indicator lamp, allowing the operator to check whether the green stability indicator lamp is illuminated.

Sensing object	Detection state	Sensitivity adjuster	Indicator state	Adjustment procedure	
Transparent pin or glass plate	Without sensing object		ON Stability indicator (green)	ON Light indicator (red)	Turn sensitivity control from minimum to maximum and set at point where incoming light stabilizes.
Opaque object	Object detected, object not detected		ON Stability indicator (green)	ON Light indicator (red)	If the object is larger than the lens diameter, set the sensitivity control to the maximum setting. If the object is the same size or smaller, turn the sensitivity control from minimum to maximum and set at point where incoming light stabilizes.

Precautions

Correct Use

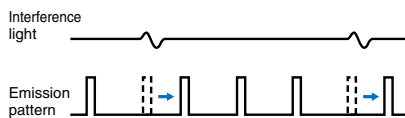
Design

Fuzzy mutual interference prevention

- If the light source switches for the reflective plates are arranged in a row, light from a neighboring light source switch may be received, causing erroneous light reception signals and errors.
- The fuzzy reciprocal interference prevention function monitors interference light for a certain period of time before illumination, and gathers data on the strength of the interference light and the frequency of incidence. It then determines the risk of error due to these two factors using fuzzy logic and controls the timing of illumination to reduce the risk.

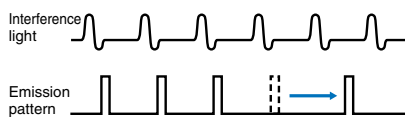
(When risk is low)

- Light is emitted after interfering light is gone.



(In case of high risk)

- Light is emitted after shifting to a gap of interfering light.



Bottles

In some cases, factors such as the shape of a bottle prevent stable detection. Please confirm that a correct detection is performed before use.

Wiring Considerations

Cable

- An oil resistant cable is used to ensure oil resistance. Avoid repeated bending of the cable.
- The bending radius should be 25 mm or more.

Avoiding Malfunctions

When using a photoelectric switch with an inverter or sub-motor, be sure to connect FG (frame ground pin) and G (ground pin). If not connected, errors may result.

Installation

Sensor installation

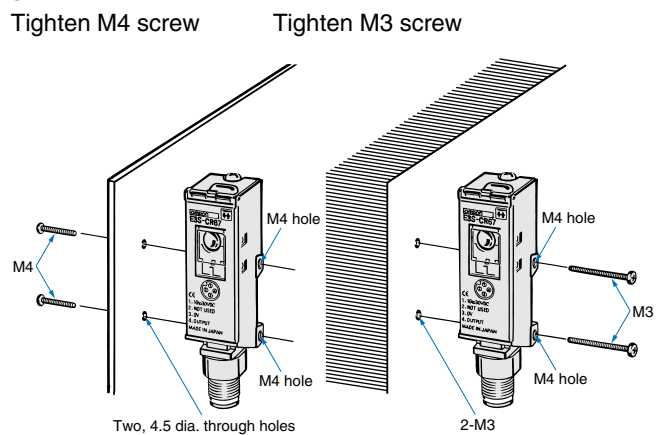
- When installing a photoelectric switch, avoid tapping with a hammer. This may damage the water resistance function.
- Use an M4 screw, tightened to a torque of no more than 1.18 Nm.

(When using the mounting bracket)

- To set the sensor on the mechanical axis, use the optical axis locking holes.
- When it is not possible to mount on the mechanical shift, move the photoelectric switch vertically or horizontally so that it is located in the center of the area illuminated by the incident light indicator lamp. Verify that the stability indicator lamp is on.

(Direct installation)

Install the photoelectric switch as shown in the following diagram.



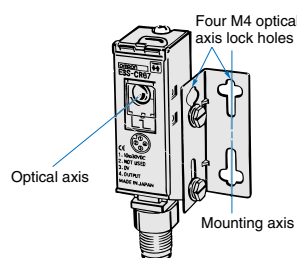
- For adjustment

Light axis adjustment

Adjust the optical axis of the clamp to the direction of detection object approach. The optical axis of the photoelectric switch is the same as the mounting axis of the clamp, enabling easy adjustment.

Optical axis locking hole

By fitting screws into the optical axis locking holes, the mounting bracket is set onto the mounting shaft of the mounting bracket.



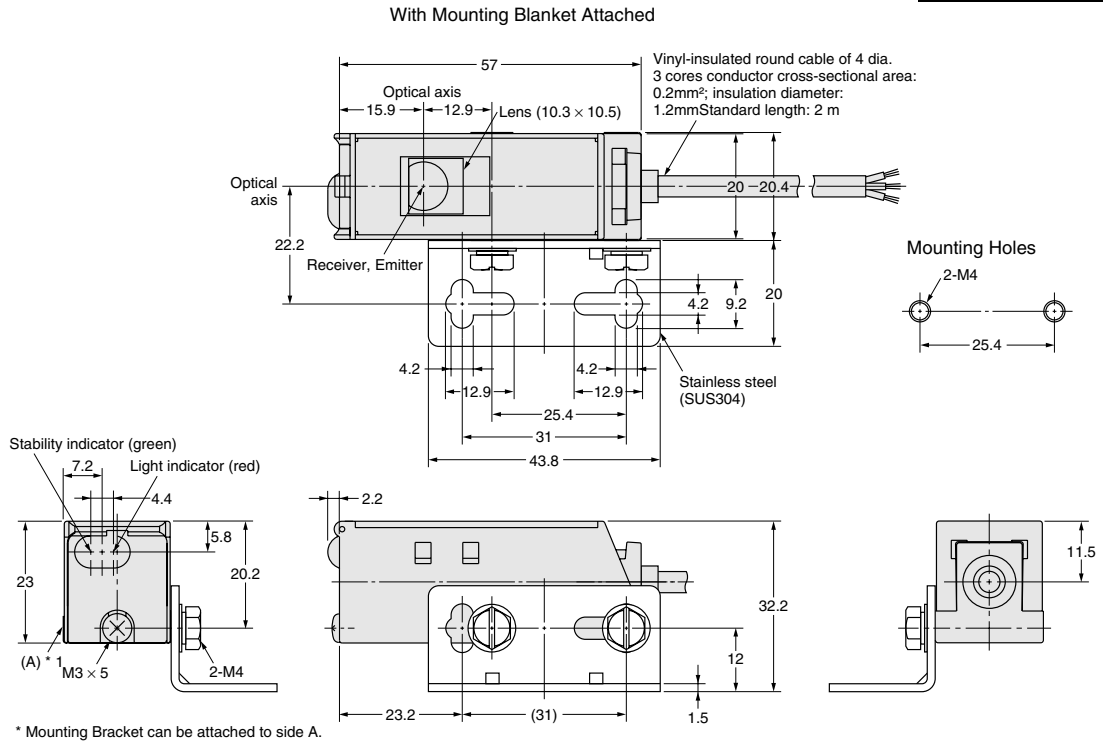
Dimensions (Unit: mm)

Sensors
Retroreflective Models

Pre-wired
E3S-CR62-C

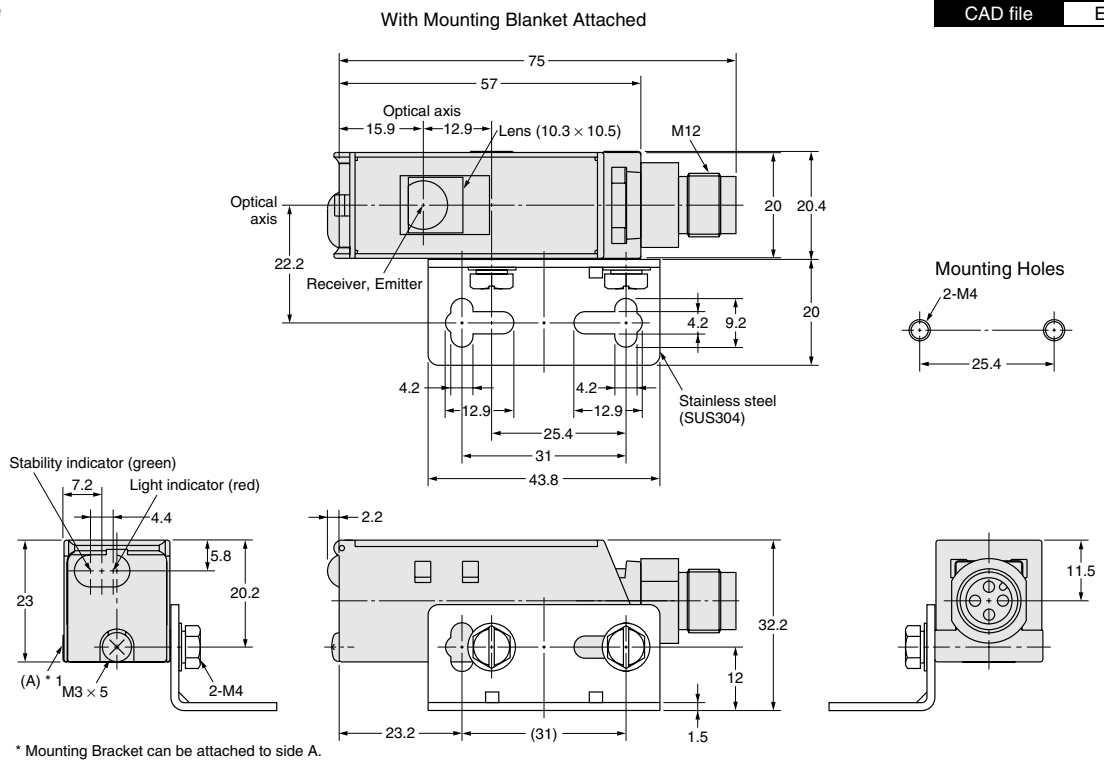
CAD file E3S_49

E3S-CR62/67



Connector type
E3S-CR67-C

CAD file E3S_50



Accessories (Order Separately)
A-314

Transparent Object Detection Sensor

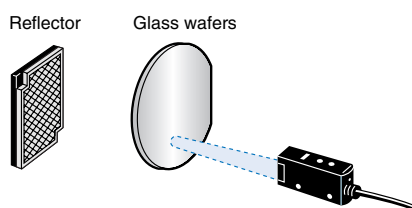
E3S-R

- Senses glass wafers and LCD glass circuit boards.



Applications

Sensing of Glass Wafers and LCD Glass Circuit Bottles



Ordering Information

Sensors

■ Red light

Sensor type	Shape	Connection method	Sensing distance		Model	
					NPN output	PNP output
Retroreflective Models	Horizontal 	Pre-wired	■ 1m [100mm] *	E3S-R11	E3S-R31	
		Connector type		E3S-R16	E3S-R36	
	Vertical 	Pre-wired		E3S-R61	E3S-R81	
		Connector type		E3S-R66	E3S-R86	

* Values in parentheses indicate the minimum required distance between the sensor and reflector.







Note: Stable detection may not be possible of some glass wafer materials. Be sure to test whether the work can be detected.

Accessories (Order Separately)

Reflectors



Name	Sensing distance	Model	Quantity	Remarks
Reflectors	Refer to ratings/performance	E39-R1	1	Supplied with the product.

Clamps/Other

Shape	Model	Quantity	Remarks
	E39-L69	1	Included as an accessory for the horizontal model.
	E39-L70	1	Included as an accessory for the vertical model.
	E39-L93	One set	Sensor adjuster: Easy mounting and adjustment on aluminum frame and rail of conveyors and other equipment.
	E39-L97	1	Horizontal protective cover clamp.
	E39-L98	1	Vertical protective cover clamp.
	E39-L60	1	Contact mounting plate: Accessory to E3S-R□.

Note: 1. If a through-beam model is used, order two Mounting Brackets for the emitter and receiver respectively.
 2. For details, refer to "Mounting bracket list".

Sensor I/O Connectors

Cable	Shape	Cable length		Model
Standard cable	Straight 	2 m	3-wire type	XS2F-D421-DC0-A
		5 m		XS2F-D421-GC0-A
	L-shape 	2 m		XS2F-D422-DC0-A
		5 m		XS2F-D422-GC0-A

Rating/performance

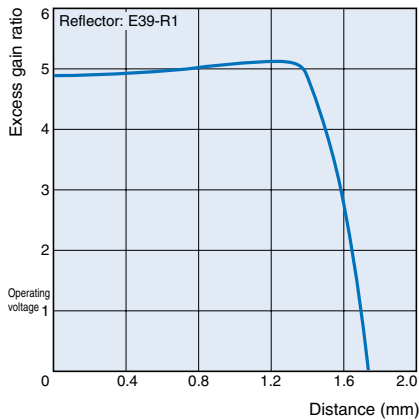
Sensor type		Retroreflective Models (with M.S.R)
Item	Model	
	NPN output	E3S-R11/-R16/-R61/-R66
	PNP output	E3S-R31/-R36/-R81/-R86
Sensing distance		1 m (100 mm) *1(When using the E39-R1)
Standard sensing object		75-mm dia. or larger opaque LCD glass plate (thickness: 0.7 mm)
Directional angle		3 to 10°
Light source (wave length)		Red LED (700 nm)
Power supply voltage		10 to 30 V DC (including 10% ripple (p- p))
Current consumption		30 mA max.
Control output		Load supply voltage: 30 VDC or less, load current: 100 mA or less (residual voltage of 1 V or less), NPN open collector output, Light ON / Dark ON switching
Protective circuits		Reverse polarity protection, output short-circuit protection, mutual interference prevention
Response time		Operation or reset: 1 ms max.
Sensitivity adjustment		2-revolution endless volume
Ambient illuminance		Incandescent lamp: 5,000 lux max. Sunlight 10,000 lux max.
Ambient temperature		Operating: 0 to +40°C, storage: -40 to +70°C (no ice formation or condensation)
Ambient humidity		Operating: 35 to 85% RH, Storage: 35 to 95% RH (no condensation)
Insulation resistance		20 M Ω min. at 500 VDC
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute
Vibration resistance		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 for 3 times each in X, Y, and Z directions
Protective structure		IEC 60529 IP67
Connection method		Pull-out cable type (standard cord length: 2 m) / connector type
Weight (Packed state)		Approximately 110 g (pull-out cable type) Approximately 60 g (connector type)
Material	Case	PBT (polybutylene terephthalate)
	Lens	Denatured polyarylate
	Mounting Brackets	Stainless steel (SUS304)
Accessories		Clamps (with screws), operation manual, reflector

*1. Values in parentheses indicate the minimum required distance between the sensor and reflector.

Characteristic data (typical)

Operating Range

E3S-R11, E3S-R61+ E39R1



Changes in light intensity when detecting various transparent objects (Note 1)

The following are the permeation rates of a various transparent objects on condition that a permeation rate of 100 means that there is no object within the sensing distance of the E3S-R. The permeation rate of any type of object sensed by the E3S-R must be as low as possible for the stable sensing of the object. Before using the E3S-R to sense objects, use samples of the objects to check if the E3S-R can sense the samples easily.

Sensing object		Model
Shape	Passage position	E3S-R11, R61, R81; E3S-R16, R66, R36, R86
		Center
Glass plate	50 x 50 t = 0.5	82
	50 x 50 t = 1	74
	50 x 50 t = 2	73
	50 x 50 t = 3	62
	50 x 50 t = 5	53
Liquid crystal glass	t = 0.5 (98% transparency)	86
	t = 0.7 (95% transparency)	81
	t = 1.1 (91% transparency)	75
Operating range		95 max.
Stable operating range		90 max.

- Note: 1 . The sensing distance of each model was set to the rated sensing distance.
 2 . The permeability values were checked with light with a wavelength of 700 μm.

Output Circuit Diagram

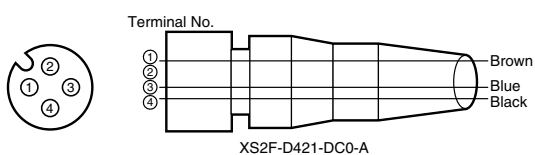
NPN output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-R11 E3S-R61 E3S-R16 E3S-R66	Light ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (Relay) Operate Reset (Between brown and black)	L•ON	<p>Connector Pin arrangement</p> <p>Note: Terminal 2 is not used.</p>
	Dark ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (Relay) Operate Reset (Between brown and black)	D•ON	<p>Connector Pin arrangement</p> <p>Note: Terminal 2 is not used.</p>

PNP output

Model	Operating status of output transistor	Timing chart	Mode selection switch	Output circuit
E3S-R31 E3S-R36 E3S-R81 E3S-R86	Light ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (Relay) Operate Reset (Between blue and black)	L•ON	<p>Connector Pin arrangement</p> <p>Note: Terminal 2 is not used.</p>
	Dark ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (Relay) Operate Reset (Between blue and black)	D•ON	<p>Connector Pin arrangement</p> <p>Note: Terminal 2 is not used.</p>

Connectors (Sensor I/O connectors)



Class	Wire, outer jacket color	Connector pin No.	Application
For DC	Brown	①	+V
	---	②	---
	Blue	③	0V
	Black	④	Output

Note: Pin 2 is not used.

Precautions

Correct Use

- For adjustment
- The passage point of the detection object should be the central point between the reflective plate and the photoelectric switch. If too close to the reflective plate, an error may result.
- To obtain sufficient detection performance, the E39-R1 must be used for the reflective plate unless otherwise specified.

Dimensions (Unit: mm)

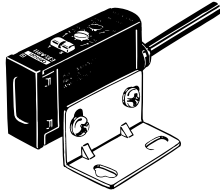
Sensors

Horizontal type

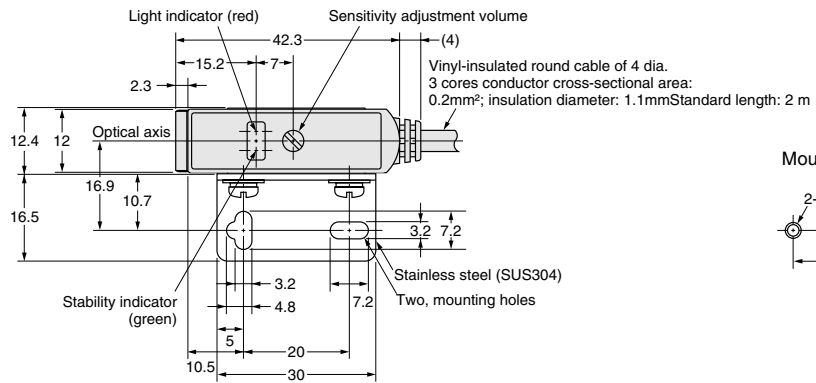
Pre-wired

E3S-R11

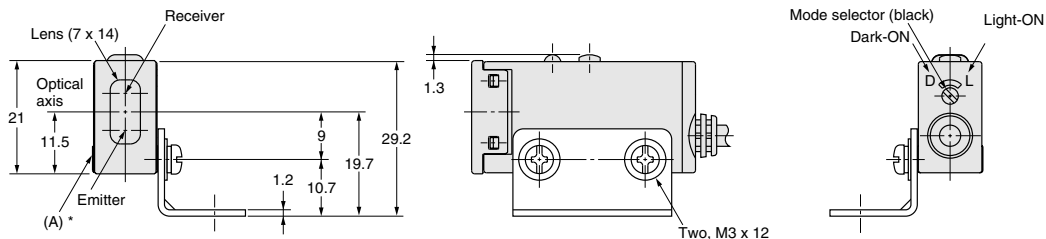
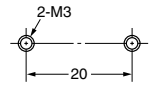
E3S-R31



With Mounting Blanket Attached



Mounting Holes



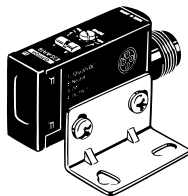
* The Mounting Bracket can also be used on side A.

CAD file E3S_29

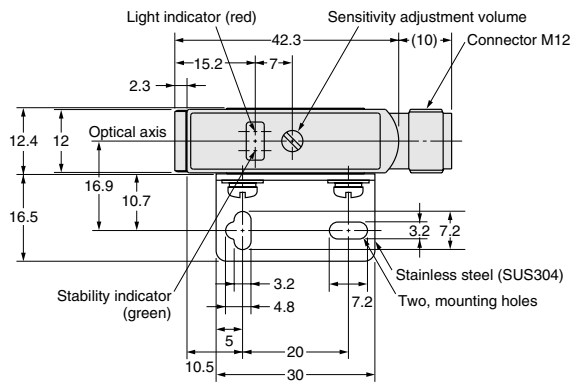
Connector type

E3S-R16

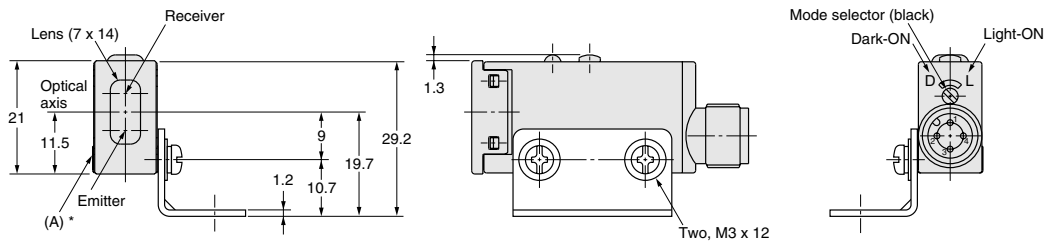
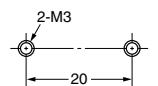
E3S-R36



With Mounting Blanket Attached



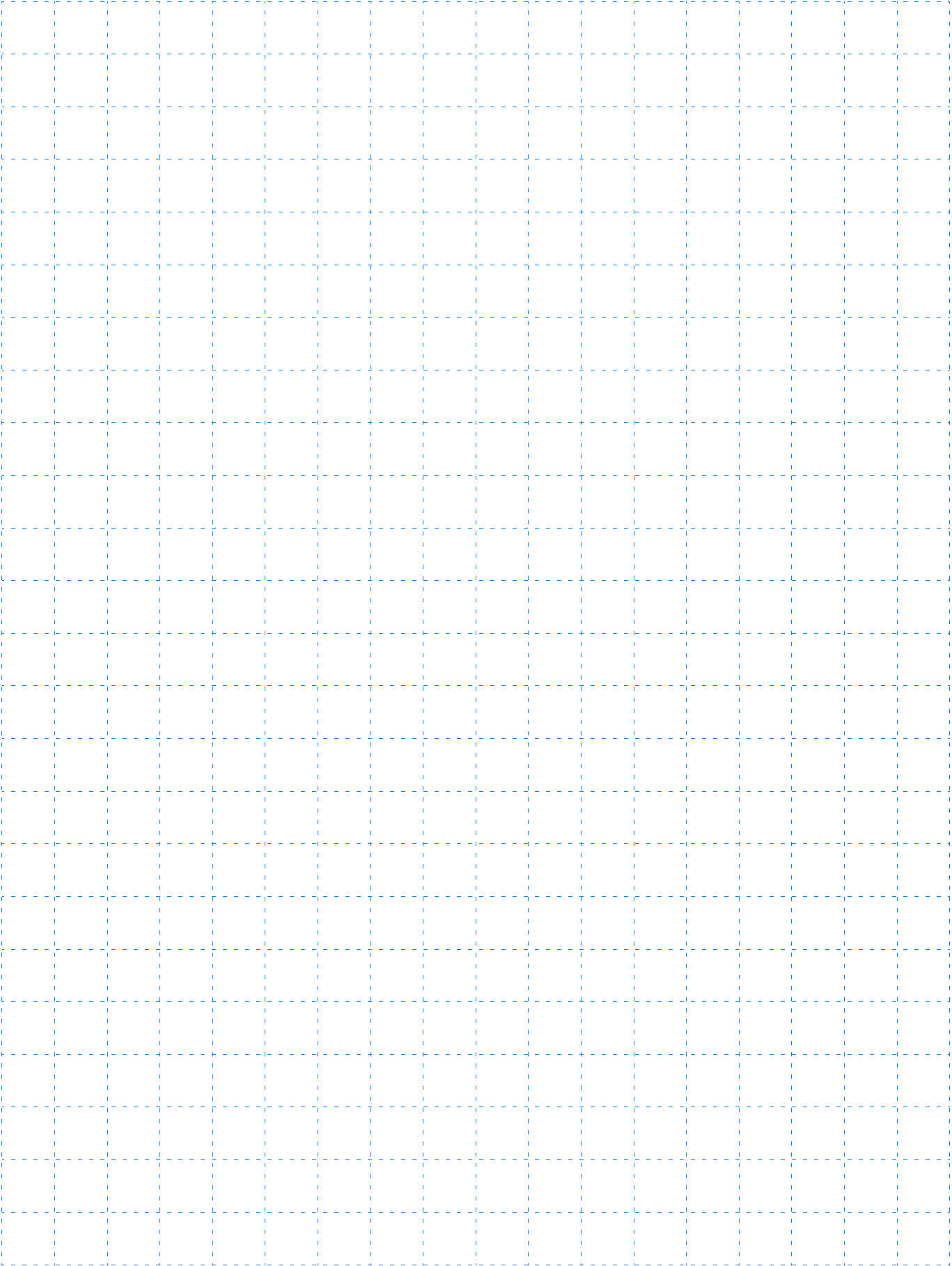
Mounting Holes



* The Mounting Bracket can also be used on side A.

CAD file E3S_30

MEMO



E3S-R

Fluid level sensor (contact type)

E32-D82F


High-accuracy detection of fluid level in washing tank.

- Uses Teflon (PFA) with excellent chemical and oil resistance.
- Capable of detecting high-temperature fluids such as sulfuric acid in a wafer washing tank. (-40 to +200°C)
- Achieves a high repetition precision of 0.5 mm (in pure water).
- Employs a dripping prevention mechanism.



Ordering Information

Fiber Units

Sensor type	Shape	Model	Remarks
Diffuse-reflective		E32-D82F1	Length of no-bending section: 150 mm from tip
		E32-D82F2	Length of no-bending section: 350 mm from tip

Applicable amplifier unit

Model
E3X-DA-N
E3X-NA

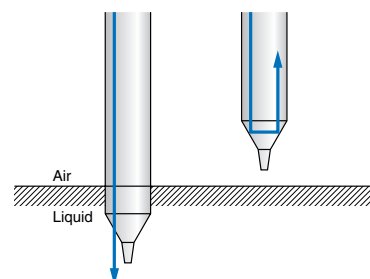
Rating/performance

Sensor type		Diffuse-reflective	
Item	Model	E32-D82F1	E32-D82F2
Standard sensing object		Pure water at 25°C	
Differential distance		3 mm max.	
Repetition precision		0.5 mm or less	
Permissible angle of detection object inclination		±10° or less	
Perimeter Temperature	Teflon section within 1.5 m of fiber tip*1	Operating: -40 to +200°C, Storage: -40°C to +85°C (with no icing or condensation)	
	Parts other than the above	Operating/storage: -40 to +85°C (no ice formation or condensation)	
Ambient humidity		Operating/storage: 35 to 85% RH	
Peripheral pressure		Operating: -50 kPa to 500 kPa	
Admissible bending radius (10% under fluid level)		40 mm or higher (25 mm for plastic fiber section)	
average)	Length of no-bending section	150 mm from tip	350 mm from tip
Material	Sensor case	Teflon (PFA)	
	Fiber cladding	Black polyethylene	
	Connector	Brass-nickel coating	
Protective structure		IEC Standard IP68*2	
Weight (Packed state)		Approx. 75 g	
Accessories		Fiber cutter	

*1. Teflon is a registered trademark of Dupont Company and Mitsui Dupont Chemical Company for their fluoride resin.

*2. Only applies to Teflon section; the standard requires no bubbling when air at 98 kPa is injected for 30 seconds at a depth of 100 mm in water.

Principle of operation



- In air, the difference between the index of refraction of the Teflon section and that of air is larger, and the light is reflected by the detected surface and returns to the light receiver.
- In the fluid, there is almost no difference between the index of refraction of the Teflon section and that of the fluid, and the light radiates into the fluid.

Operation

● Teaching type

1. Using teaching without work

Perform teaching with the tip of the fiber unit in the fluid. (The sensitivity is set to the top 10% of the received light intensity in fluid for stronger performance with respect to fluctuations in received light intensity due to fluid leakage, and thus teaching without work for high viscosity fluids is effective.)

2. Using teaching with/without work

Perform teaching after the object has been removed from the fluid, and then repeat teaching with the object in the fluid. (Teaching with/without work is effective for fluids in which bubbles form at high temperature.)

Note: If set to the maximum sensitivity with the object removed from the fluid, detection of the fluid will no longer be possible.

● Sensitivity control type

Sequence	Detection state	Sensitivity adjuster	Indicator state		Adjustment procedure
1			Green OFF	Red OFF	Determine the position A at which the incident light indicator lamp (red) illuminates as the sensitivity control is gradually increased from the minimum setting after the object has been removed from the fluid.
2			Green OFF	Red OFF	<ul style="list-style-type: none"> If the red indicator lamp illuminates at the maximum sensitivity setting, gradually decrease the sensitivity control from the maximum setting with the object in the fluid, and determine the position B at which the incident light indicator lamp (red) goes off. If the red indicator lamp goes off at the maximum sensitivity
3	---		Green ON	Red OFF	Set the sensitivity control to C midway between A and B. At this time, verify that the stability indicator lamp (green) illuminates both with and without fluid.

Precautions

Correct Use

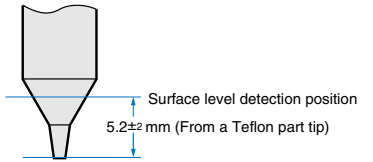
Installation

- Use the no-bending section to secure the fiber unit. If the fiber unit is secured without using the no-bending section, the fluid level detection position may shift.
- Influences from the sides or bottom may interfere with detection. In that case, remove to a distance that is not subject to these influences, or apply a black coating to the sides and bottom.
- If you need to use the system in a dangerous location, use only the fiber unit in the dangerous location and place the amplifier unit in a safe location.

● For adjustment

About the fluid level detection position

The fluid level detection position is located 5.2±2 mm from the tip of the Teflon section (see the diagram at right). The fluid level detection position will vary depending on the surface tension of the fluid and the dampness of the detection position of the fiber unit.

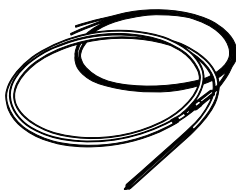


Miscellaneous

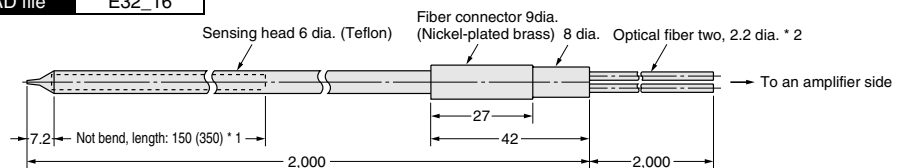
- Operation will not be stable in the following situations. ① Bubbles adhere to the cone of the detector head. ② Solutes have precipitated onto the cone of the detector head. ③ The fluid has a high viscosity.
- Some fluids such as those of a milky-white color may not permit detection.
- Take care not to strike the tip with any object. A damaged or deformed detector head may cause unstable operation.

Dimensions (Unit: mm)

E32-D82F1
E32-D82F2



CAD file E32_16



* 1. (): E32-D82F2 dimensions
* 2. Freely cut because 2m part of optical fiber at amplifier side is made from a plastic fiber.

Fluid level sensor (fiber pipe type)

E32-L25T

For installation of thin pipe (thickness of 10 mm) that can be used even in combustible atmospheres

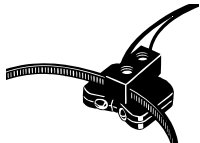
- Easy post-installation on unit or pipe using band.
- Affordable pricing makes a big contribution to cost reduction when upgrading equipment.
- Thin pipe of thickness = 10 mm. Contact mounting is possible to enable detection of level differences to a minimum of 4 mm.
- Can also be used in combustible atmospheres.*

* Plastic is used in the lens, unit case, and fiber coating. Avoid contact with solvents as these will cause corrosion and deterioration (clouding).



Ordering Information

Fiber Units

Sensor type	Shape	Model
Reflective model		E32-L25T

Applicable amplifier unit

Model
E3X-DA-N
E3X-NA

Rating/performance

Sensing method		Reflective model
Item	Model	E32-L25T
Clamping pipe (outer diameter)		Transparent pipe, 8 mm to 10 mm dia. (6 mm to 8 mm inner diameter)*1
Applicable pipe material		Transparent pipe (FEP or with equivalent transparency)
Sensing object		Fluid *2
Repetition precision		1 mm max.
Ambient temperature		Operating/storage: -40 to +70°C (no ice formation or condensation)
Ambient humidity		Operating: 35% to 85% RH, Storage: 35% to 95% RH (with no icing or condensation)
Permissible bending radius		10 mm min.
Material	Sensors	Polycarbonate
	Fiber	Plastic (polyethylene coating)
Protective structure		IEC 60529 IP50
Weight (Packed state)		Approx. 10 g
Accessories		Band, anti-reflection sheet, fiber cutter

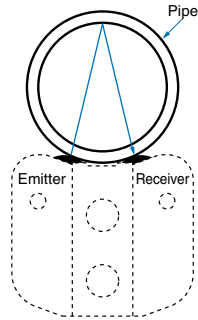
*1. The E32-L25T6 for a 6 mm dia. transparent pipe is also available. The model type is E32-L25T6.

*2. When using an opaque fluid, test detection with the unit before using.

Principle of operation

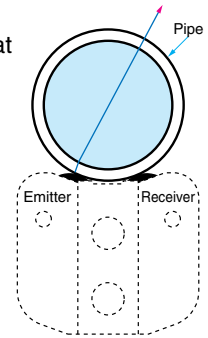
No fluid

If no detection fluid, light state.



Fluid

If there is detection fluid, set so that dark state is effective.

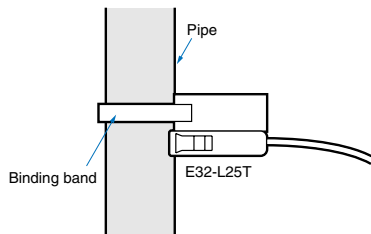


Precautions

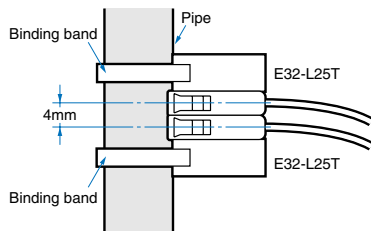
Correct Use

Installation

- If only the Fiber Unit is installed, proceed according to the following basic procedure.

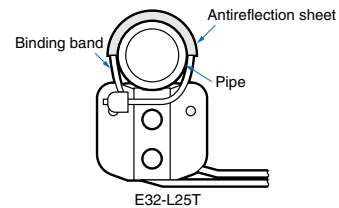


- Detection of level differences to a minimum of 4 mm is possible with the following installations.



- Do not expose the fiber unit to undo forces such as pulling or compression (no more than 0.1 Nm).
- The bending radius of the fiber unit should be no less than the allowed bending radius (both rated and performance).

- When securing with the band, take care that the fiber is not deformed.
- If an opaque pipe is used, this may result into incorrect operation.
- Water drops, air bubbles, or clouding in the pipe may cause incorrect operation.
- If the background exerts an effect, use the anti-reflection sheet (accessory) (see the diagram below). The anti-reflection sheet also serves to prevent shifting due to fiber unit vibration.



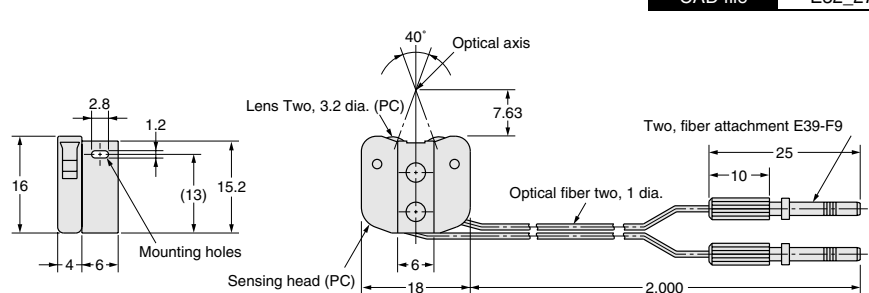
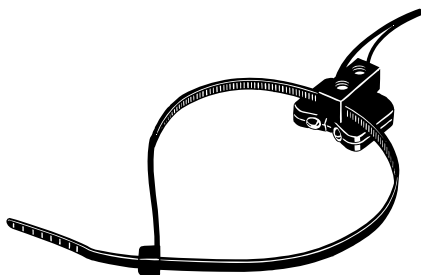
Miscellaneous

Polycarbonate is used in the case. Do not allow contact with chemicals such as alkalis, aromatic hydrocarbon, or chloro-aliphatic hydrocarbon, as these will dissolve the case.

Dimensions (Unit: mm)

E32-L25T

CAD file E32_27

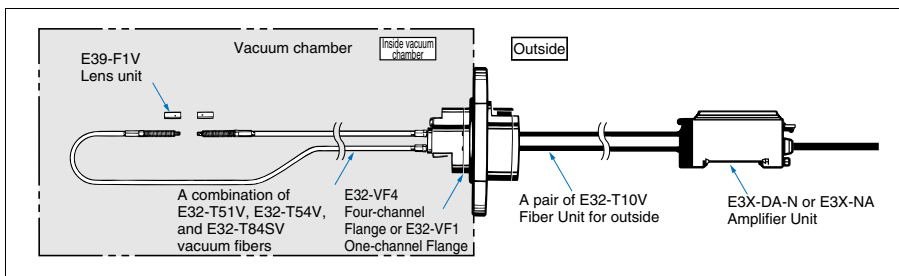


Vacuum Sensor E32-V

- The 4-CH multi-flange contributes to conserve vacuum chamber space.
- One-touch fiber installation significantly reduces man-hours (4-CH flange).
- The fiber unit for outside can be freely cut on both ends, thus avoiding messy routing.
- A screw-type 1-CH flange is also available.
- Heat-resistant vacuum fiber is also available for high-temperature environments.



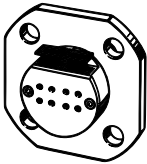

Configuration (typical example)






Ordering Information

Sensors

Flanges


Shape	Item	Model
	4-CH flange	E32-VF4
	1-CH flange	E32-VF1

Vacuum Fibers

Shape	Item	Model *
	Through-beam, straight model	E32-T51V 1M
	Through-beam, L-shaped model	E32-T54V 1M
	Through-beam, Heat-resistant model	E32-T84SV 1M


* A 0.5-m type is also available. Please inquire for more information.

Fiber Unit for Outside


Shape	Item	Model
	General	E32-T10V 2M

Accessories (Order Separately)

Mounting Brackets

Shape	Model	Quantity	Remarks
	E39-L54V	2	Can be used with the E32-T54V.

Lens Unit

Shape	Model	Quantity	Remarks
	E39-F1V	2	Long distance lens unit: Can be used with the E32-T51V and E32-T54V.

Rating/Performance

Flanges

Number of channels	4	1 CH	
Item	Model	E32-VF4	E32-VF1
Leakage	1 x 10 ⁻¹⁰ Pam ³ /s or less		
Ambient temperature	Operating/storage: -25 to +55°C		
Material	Aluminum (A5056)	Stainless steel (SUS304) Aluminum (A5056)	
Flange seal material	Fluoroelastomer (Viton)		
Weight (Packed state)	Approx. 280 g	Approx. 240 g	

Fiber Unit for Outside

Sensor type		Fiber Unit for Outside
Item	Model	E32-T10V
Standard length		2 m (free cutting allowed)
Ambient temperature		Operating/storage: -25 to +70°C
Permissible bending radius		25 mm min.
Weight (Packed state)		Approx. 170 g
Material	Core	Acrylics
	Sheath	Fluororesin
	Protection tube	Black polyethylene

Vacuum Fibers

Sensor type		Vacuum-side fiber transmission type			
Item	Model	E32-T51V	E32-T54V	E32-T84SV	
Standard length		1 m (no free cutting)			
Sensing distance	When using the E3X-DA-N	Super long-distance mode:	250 mm	200 mm	600mm
		Standard mode:	200 mm	130mm	480mm
		Super high-speed mode:	70mm	50 mm	180mm
	When using the E3X-NA	100 mm	65mm	250 mm	
Ambient temperature		Operating/storage: -25 to +120°C		Operating/storage: -25 to +200°C	
Admissible bending radius		30 mm min.		25 mm min.	
Weight (Packed state)		Approx. 180 g	Approx. 170 g	Approx. 180 g	
Material	Core	Quartz		Optical glass	
	Sheath	Fluororesin		Optical glass	
	Protection tube	Fluororesin		Stainless steel (SUS304)	
	Fiber head/Connection tube	Aluminum (A5056)•Stainless steel (SUS304)			

Lens Unit

Item		Sensor type Model	Long-Distance Lens Units	
			E39-F1V	
Applicable Fiber			E32-T51V	E32-T54V
Sensing distance	When using the E3X-DA-N	Super-long-distance mode:	1280mm	630mm
		Standard mode:	1000mm	500 mm
		Super-high-speed mode:	360mm	250 mm
When using the E3X-NA			600mm	390mm
Ambient temperature		Operating/storage: -25 to +120°C		
Weight (Packed state)		Approx. 5 g		
Material	Housing	Aluminum (A5056)		
	Lens	Optical glass		

Precautions

Important

Mounting

Cleaning

Although Flanges, Vacuum Fibers, and Lens Units are cleaned before shipping, clean them with alcohol before use in high-vacuum chambers to make sure there is no foreign matter on them.

Pulling and compression

Do not expose the fiber unit to pulling, compression, or other undo force (29.4 N or less).

Miscellaneous

Application

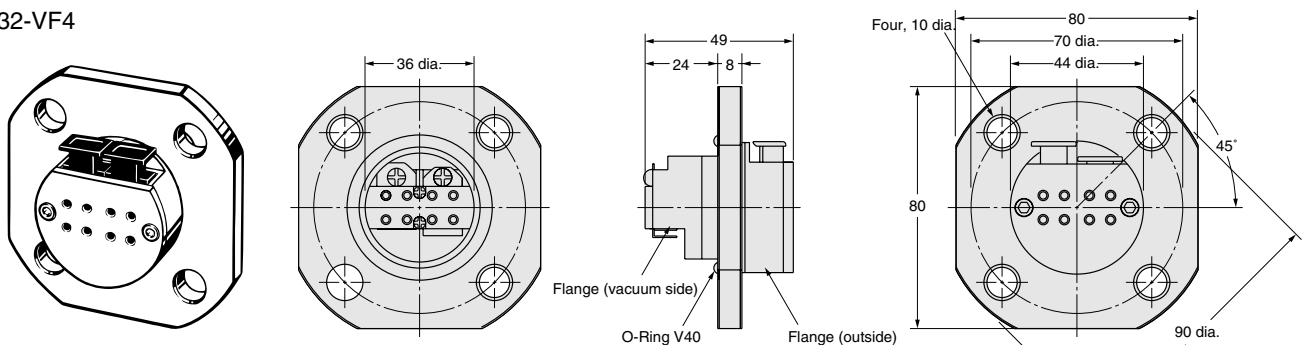
This vacuum-proof fiber unit is used to detect various types of work in a high-vacuum and 120°C (in parts 200°C) high-temperature chamber (vacuum chamber).

Dimensions (Unit: mm)

Sensors

Flanges

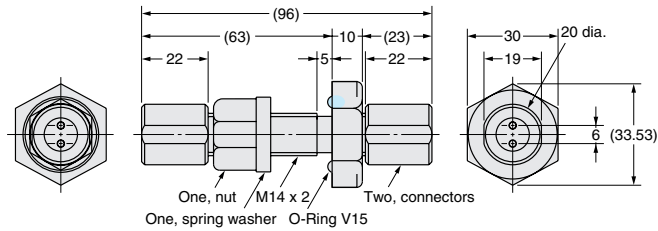
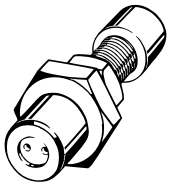
E32-VF4



- Note: 1. Set the O-Ring V40 to come to the wall of the vacuum chamber on the atmosphere side.
 2. Mounting hole: 38±0.5 mm

CAD file E32_64

E32-VF1

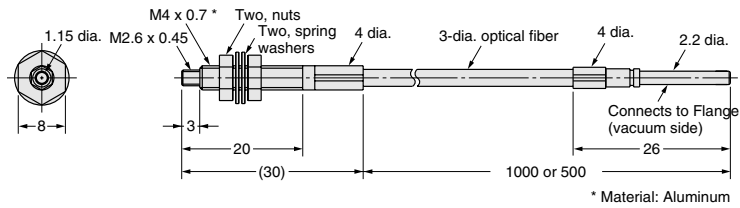


Note: 1. Set the O-Ring V15 to come to the wall of the vacuum chamber on the atmosphere side.
2. Mounting hole: 14.5±0.2 mm

CAD file E32_65

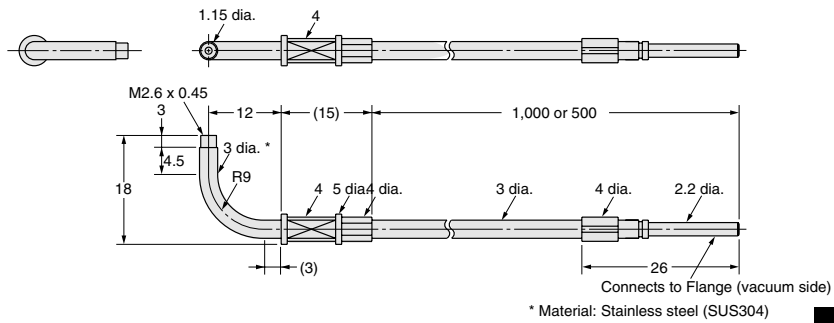
Vacuum Fibers

E32-T51V



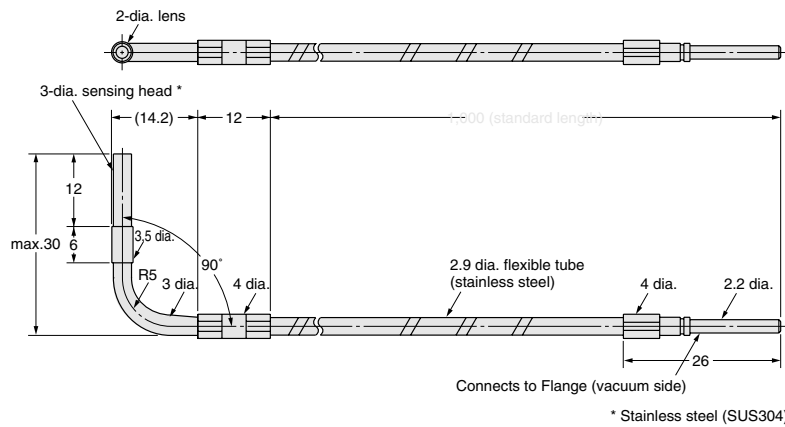
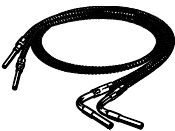
CAD file E32_58

E32-T54V



CAD file E32_60

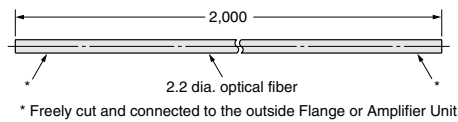
E32-T84SV



CAD file E32_62

Fiber Unit for Outside

E32-T10V



CAD file E32_59

Accessories (Order Separately)

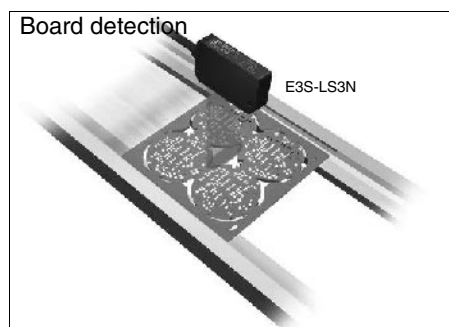
Printed Circuit Board Sensor E3S-LS3N

Printed circuit board sensor capable of stable detection without being affected by holes or notches.

- Suitable for incorporation in devices (E3S-LS3N).
- Wide range is suitable for component boards with high or irregularly shaped components (E3S-LS3NW).



Applications



Ordering Information

Sensor type	Shape	Connection method	Detection distance *	Output form	Model
Limited reflective		Pre-wired	20 to 35 mm	Light ON	E3S-LS3N
			10 to 60 mm		E3S-LS3NW NEW

* Using 80 x 80 mm white art paper

PNP output models will be available soon. Please contact your OMRON sales representative.

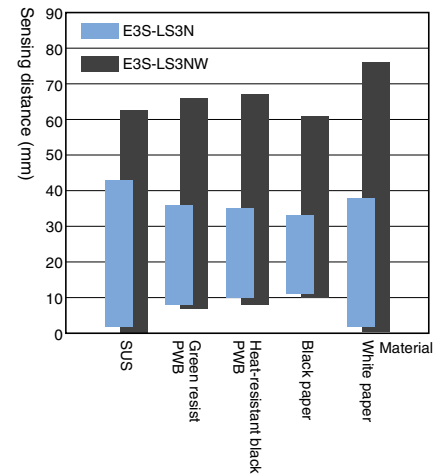
Rating/performance

Item		Sensor	
		Limited reflective	
		E3S-LS3N	E3S-LS3NW
Sensing	White art	20 to 35 mm	10 to 60 mm
	Blackpaper	20 to 30 mm	15 to 50 mm
Light source (wave length)		Red LED (660 nm)	
Power supply voltage		12 to 24 V DC \pm 10%, ripple (p-p) 10% or less	
Current consumption		25 mA max.	
Control output		Load supply voltage: 24 VDC or less; load current: 50 mA or less (residual voltage 1 V or less); NPN open collector output type	
Response time		Operation or reset: 1 ms max.	
Ambient illuminance		Incandescent lamp: 5,000 lux max.	
Ambient temperature		Operating: -10° to 55°, Storage: -25° to 70°C (with no icing or condensation)	
Ambient humidity		Operating: 35% to 85%RH, Storage: 35% to 95%RH (with no condensation)	
Insulation resistance		20 M Ω min. at 500 VDC	
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance		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 for 3 times each in X, Y, and Z directions	
Protective structure		IEC Standard IP40	
Connection method		Pre-wired models (standard length: 2 m)	
Weight (Packed state)		Approx. 50 g	
Material	Case	Heat-resistant ABS resin	
	Lens	Acrylics	
Accessories		Instruction manual	

* At 80 x 80 mm

Characteristic data (typical)

Detection range - material properties
E3S-LS3N/E3S-LS3NW



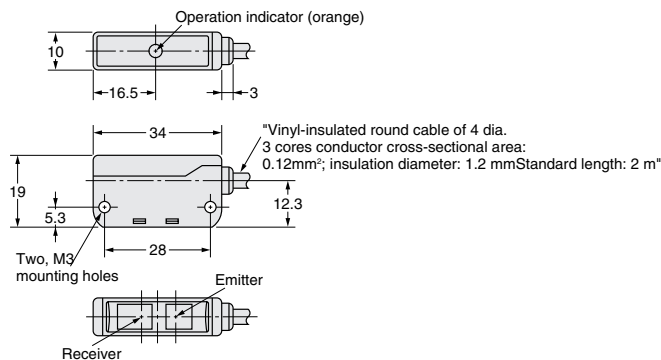
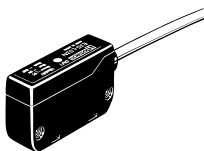
Output Circuit Diagram

NPN output (PNP output will be available soon)

Model	Operating status of output transistor	Timing chart	Output circuit
E3S-LS3N E3S-LS3NW	Light ON	<p>Incident Interrupted</p> <p>Operation indicator (orange) ON OFF</p> <p>Output transistor ON OFF</p>	<p>Brown 12 to 24 VDC</p> <p>Black OUT</p> <p>Blue 0V</p>

Dimensions (Unit: mm)

E3S-LS3N
E3S-LS3NW

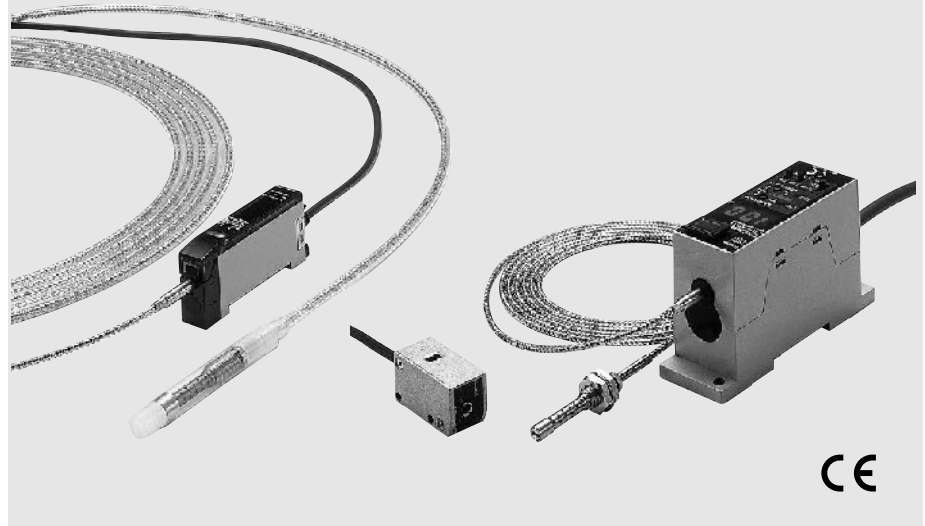


CAD file E3S_51

Ultraviolet power monitor/illumination monitor

F3UV

Monitoring output state of UV (ultraviolet light)/illumination light source



Features

Optical Fiber Type

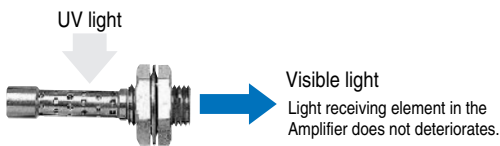
Can be used as ultraviolet power monitor/illumination monitor

Fiber Units

● UV Power Monitor

Heat resistance applications

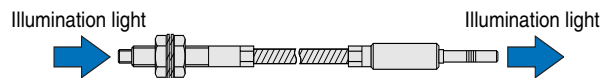
Head can resist heat up to 300°C (using F3UV-HM) Converts harmful ultraviolet light into visible light
Case is made of ozone-proof and heatproof stainless steel (SUS303).



- F32-300, F32-70
- F3UV-XW11/41, F3UV-XA

● During projection monitoring

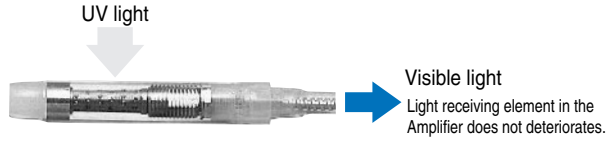
Monitors projected light through fiber unit.



- F32-300, F32-70
- F3UV-XW11/41, F3UV-XA

Waterproof applications

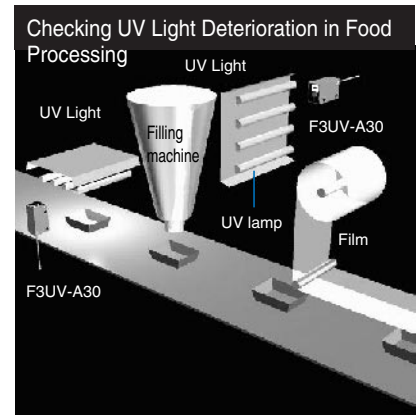
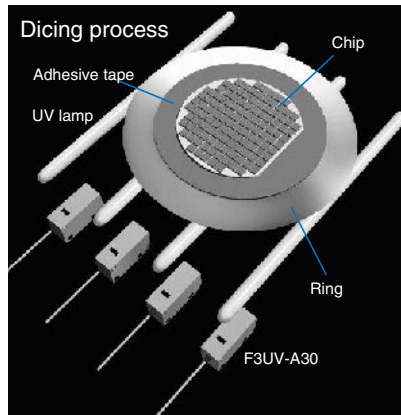
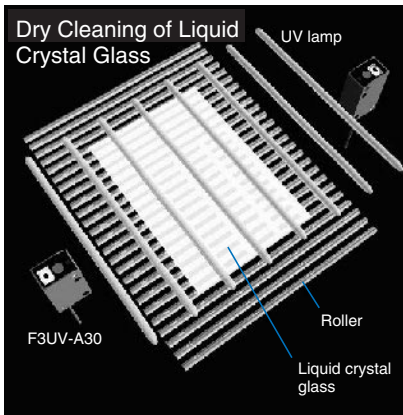
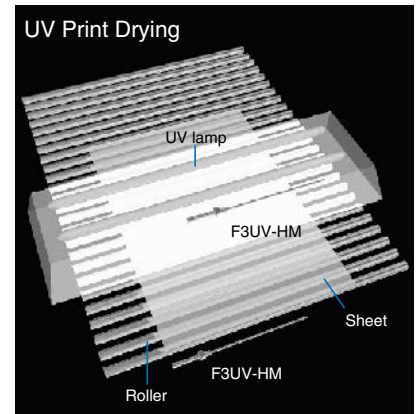
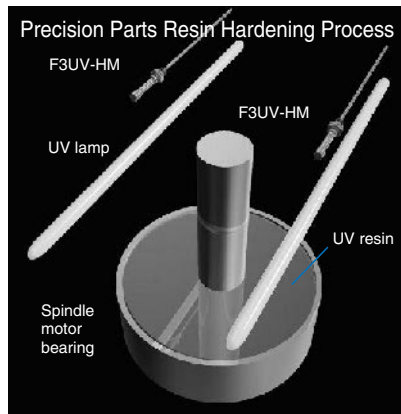
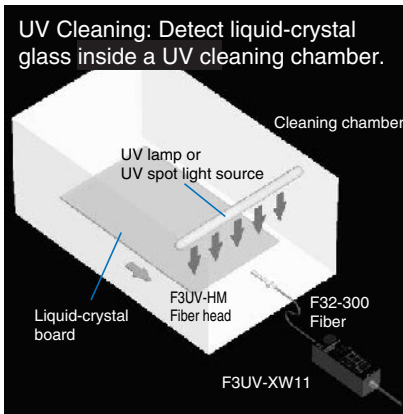
Head can resist heat up to 150°C
 (using F3UV-HM) Converts harmful
 ultraviolet light into visible light



(Fiber unit not required)

F3UV-XW11/41, F3UV-XA

Application



Features

Optical Fiber Type

Amplifier Units

- F3UV-XW Series

Digital % display for easy visualization of measured values

7-segment digital % display

Easy teaching scheme

Button teaching is possible for zero-point setting and sensitivity setting.

Output form can be selected.

Two outputs: current/voltage output + decision output

- F3UV-XA

Sensitivity control scheme

Fine adjustment possible with 8-revolution dial.

Verify output form with operation indicator lamp

Illuminates at approximate range of 4 to 5 V

Built-in Amplifier Type

(Cannot be used as illumination monitor)

About 1/10th the cost

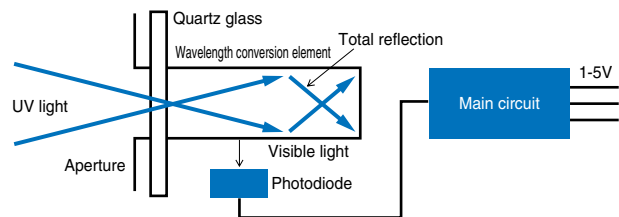
The price is about 1/10th the price of a dedicated measuring instrument

Protective Structure to Prevent UV Deterioration.

A zinc die-cast case and synthetic quartz glass for the light receiving window.

Protective tubes and covers available as options.

(Option)



Monitor UV Light Output Status with an Operation Indicator.

(Lit at approx. 4 to 5 V.)

With control for sensitivity adjustment

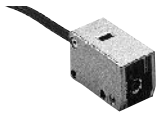
Filter Cover (reduced by 1/6.5) Available.

Ordering Information

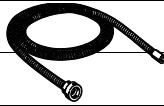



F3UV

Built-in Amplifier Type

Sensors

Shape	Intensity range of incident light	Output	Model
	1 to 30 mW/cm ²	Analog voltage output (1 to 5 V)	F3UV-A30
	0.2 to 3 mW/cm ²		F3UV-A03



Accessories (Sold Separately)

Shape	Name	Model
	Protective Tube (Protects the cord.)	F39-CU1M
	Protective Cover (Protects the display.)	F39-HU2
	1/6.5 Filtering Cover	F39-HU1
	Mounting Brackets	F39-L9

Optical Fiber Type



Sensors

Amplifier Unit

Shape	Connection method	Output	Output form	Model
	Pre-wired	<ul style="list-style-type: none"> Evaluation output Answer-back output Current/voltage analog output 	NPN output	F3UV-XW11 *
			PNP output	F3UV-XW41
		Analog voltage output	---	F3UV-XA





* A model with 5 times higher sensitivity is also available.

Head Unit (can only be used as UV power monitor)

Shape	Wavelength range of incident light	Max. temperature	Model	Remarks
 *1	200 to 370 nm	300°C*2	F3UV-HM	Includes two M8 nuts and one mounting plate.
 *3		150°C	F3UV-HT 5m	<ul style="list-style-type: none"> Waterproof and chemical-resistant Teflon cover *4 For the mounting procedure, see "Please use correctly". For the incoming light power range, please inquire separately.
			F3UV-HT 10 m	

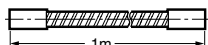
- *1. The fiber unit is required for connection to the amplifier unit.
- *2. Use within the operating temperature range of the fiber unit you are using.
- *3. Can be directly connected to the amplifier unit.
- *4. Teflon is a registered trademark of the Dupon Company and the Mitsui Dupon Chemical Company for their fluoride resin.

Fiber Units

Compatible Amplifier Units	Compatible Head Units	Shape*1	Max. temperature	Intensity range of incident light*2	Model	Quantity
F3UV-XW11 F3UV-XW41	F3UV-HM*3	 M4 screw	300°C	10 to 300 mW/cm ²	F32-300	1 pc.
		 M4 screw	70°C		F32-70	
F3UV-XA		 M4 screw	300°C	30 to 300 mW/cm ²	F32-300	
		 M4 screw	70°C		F32-70	

- *1. The values given are for a standard UV light source with a central wavelength of 360 nm, measured with a standard illumination meter (and for use in combination with the specified Amplifier and Head Unit). The power range is one for which teaching to 100% is possible.
- *2. For the fiber length, please inquire separately.
- *3. Not required when using as an illumination monitor.

Accessories (Order Separately)

Shape	Name	Model	Quantity	Applicable Fiber Units
	Protective Tube (Protects the fiber.)	F39-FU1M	1 pc.	F32-70

Rating/performance

Built-in Amplifier Type

Main Unit

Item	Model	F3UV-A30	F3UV-A0
Intensity range of incident light*1		1 to 30 mW/cm ²	0.2 to 3 mW/cm ²
Wavelength range of incident light		200 to 370 nm	
P indicator		Green LED	
Operation indicator		Orange LED (illuminates at an output of approximately 4 to 5 V)	
Sensitivity adjuster		One-turn adjuster	
Supply voltage		12 to 24 VDC ±10%	
Current consumption		15 mA max.	
Response time*2		300 ms max.	400 ms max.
Output*3		1 to 5 V (offset voltage of 0.2 V or higher)	
Connection impedance		100 kΩ min.	
Repetition precision		±2% F.S. max.	
Temperature drift		0.2% of F.S./°C max.	
Ambient illuminance*4		Fluorescent light 1,000 lx max.	Fluorescent light 500 lx max.
Ambient temperature		-10° to 70°C	
Ambient humidity		35% to 85%	
Ambient temperature		-25° to 80°C	
Insulation resistance		20 M Ω min. at 500 VDC	
Dielectric strength		1,000 VAC for 1 min.	
Vibration resistance		10 to 150 Hz, half amplitude of 0.1 mm in 3 directions: X, Y, and Z, 8 min x 10 sweeps each	
Shock resistance		150 m/s ² , 3 times each in ±X, ±Y, and ±Z directions	
Protective structure		IEC Standard IP30	
Connection method		Pre-wired models (standard length: 2 m)	
Weight (Packed state)		78 g	
Material	Case	Zinc diecast	
	Window:	Synthetic quartz glass	
Accessories		Instruction manual	

- *1. Using a standard UV light source and UV illumination meter in a power range for which analog output can be set to 5 V.
- *2. The response time is the rise time of the output signal to 10 to 90%.
- *3. An output voltage up to 6 V can be output. Adjust the sensitivity so that the output is less than 5 V. The output is 0.2 to 1 V when there is no incident UV light.
- *4. This value is the illumination at the receiver window maintaining an offset voltage of 1 V max. with the fluorescent light.

Accessories (Order Separately)

Protective Tube (Protects the cord.)

Item	Model	F39-CU1M
Shape		
Ambient temperature		Operating/storage: -40 to +100°C (must use in operating temperature range of sensor)
Ambient humidity		Operating: 35% to 85% Storage: 35% to 95%
Bending radius		24 ±5mm
Tensile strength		Gap between head connector/end cap and tube: 2 Nm or less, tube: 2 Nm or less
Compression load		Tube: 9.8 Nm (lateral pressure load)
Material	Head connector	Brass nickel plating
	End cap	Brass nickel plating
	Tube	Stainless steel (SUS304)
Accessories		M2 screws

Optical Fiber Type

Sensors
Amplifier Units

Item	Model	F3UV-XW11*1	F3UV-XW41	F3UV-XA
Power supply voltage		12 to 24 VDC ±10%		
Current consumption		75 mA max.		15 mA max.
Out-put	Analog output	Current (4 to 20 mA)/Voltage (1 to 5 V) (when using light intensity monitor and light intensity integration mode)		Voltage (1 to 5 V) (offset voltage of 0.2 V or less)
	Discrimination output	NPN open collector output, 100 mA or less, residual voltage 1 V or less (when using light intensity monitor and light intensity integration mode)	PNP open collector output, 100 mA or less, residual voltage 2 V or less (when using light intensity monitor and light intensity integration mode)	---
	Answer-back output	NPN open collector output, 100 mA or less, residual voltage 1 V or less (when using light intensity monitor and light intensity integration mode)	PNP open collector output, 100 mA or less, residual voltage 2 V or less (when using light intensity monitor and light intensity integration mode)	---
In-puts	Remote teaching input	When ON: 0 V short circuit (short circuit current of 1 mA or less) When OFF: Open circuit (open or 9 V or higher and 24 V or less)	When ON: Power supply voltage short circuit or 9 V or higher and 24 V or less (short circuit current of 3 mA or less) When OFF: Open circuit (open or 1.5 V or less)	---
	Reset input	When ON: 0 V short circuit (short circuit current of 1 mA or less) When OFF: Open circuit (open or 9 V or higher and 24 V or less)	When ON: Power supply voltage short circuit or 9 V or higher and 24 V or less (short circuit current of 3 mA or less) When OFF: Open circuit (open or 1.5 V or less)	---
Protective circuits	Protection from load short-circuit and reversed power supply connection			
Response time*2	500 ms max.		300 ms max.	
Sensitivity setting	Teaching		8-revolution dial type	
Indicator lamp	Measurement/teaching indicator lamp (green/red) Operation indicator lamp (orange) 7 segment digital percent display (red) 7 segment digital threshold value display (red)		Power display (green) Operation display (orange)	
Repetition precision	±2% F.S. max.			
Ambient illuminance	Fluorescent light 1,000 lx max.*3		Fluorescent light 1,000 lx max.*4	
Temperature drift	±0.1% of F.S./°C max		0.2% of F.S./°C max.	
Ambient temperature	Operating: -25 to +55°C, Storage: -40 to +70°C (with no icing or condensation)			
Ambient humidity	Operating/storage: 35% to 85% RH			
Insulation resistance	20 M Ω min. at 500 VDC			
Dielectric strength	Lead wires to case: 1,000 V AC 50/60 Hz			
Vibration resistance	10 to 150 Hz, half amplitude of 0.1 mm, or 15 m/s ² , 2h each in X, Y, and Z directions			
Shock resistance	150 m/s ² , 3 times each in X, Y, and Z directions			
Protective structure	IEC Standard IP30		IEC 60529 IP50	
Connection method	Pre-wired models (standard length: 2 m)			
Weight (Packed state)	Approx. 270 g		Approx. 60 g	
Material	ABS			
Accessories	Instruction manual		Operation manual, adjustment driver, clamps	

*1. A model with 5 times the sensitivity is also available.

*2. Response time: 10% to 90% of rise and fall time of analog output signal.

*3. An analog output of up to 6 V (or 24 mA) can be output. The output is 1 V (or 4 mA) when there is no incident UV light.

*4. Shows value at which offset voltage can maintain 1 V or less using fluorescent lamp.

Note: 1. Analog output outputs up to approximately 6 V (24 mA). Outputs 1 V (4 mA) when there is no incoming light.

2. F.S. stands for full scale. For a current output, full scale is 16 mA (4 to 20 mA).

Voltage output: 4 V (1 to 5 V)

3. Definition of the luminous energy integral: The physical unit of the luminous energy integral is energy (J: joules) and this value is calculated by multiplying the UV intensity (mV) by the time of exposure (s), but it is dimensionless when this sensor's analog output value (V) is used for the UV intensity. The integral is measured with an 11 ms sampling time.

Head unit

Item	Model	F3UV-HM	F3UV-HT (both 5m and 10m)
Wavelength range of incident light		200 to 370 nm	
Temperature drift		-0.15%/°C max.	
Ambient temperature		Operating/Storage: -40° to 300°C (with no icing or condensation)	Operating/Storage: -40° to 150°C (with no icing or condensation)
Ambient humidity		Operating/Storage: 35% to 85% RH (with no icing or condensation)	
Vibration resistance		10 to 55 Hz, half amplitude of 0.75 mm or 100 m/s ²	
Shock resistance		500 m/s ²	
Weight (Packed state)		30 g	5 m cable: approximately 170 g, 10 m cable: approximately 380 g
Material	Protective casing	Stainless steel (SUS303)	Fluororesin
	Fluorescent fiber path	Functional fluoroglass	
Accessories		M8 nut and mounting bracket	---

Optical Fiber Type

Sensors

Fiber Units

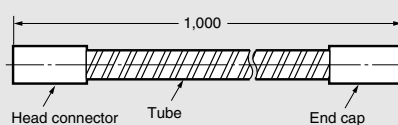
Item	Model	F32-300	F32-70
Ambient temperature	Operation	-40° to 300°C*1	-40° to 70°C
	Storage	-40° to 110°C	-40° to 70°C
		(with no icing or condensation)	
Ambient humidity		Operating: 35% to 85% RH, storage: 35% to 95% RH (with no icing or condensation)	
Permissible bending radius		25 mm min.	
Fiber sheath material		SUS	Black polyethylene
Protective structure		IEC 60529 IP67	
Standard fiber length		2 m *2	

*1. Heat-resistance temperatures vary depending on the fiber part. See the dimensions for details.

*2. For the fiber length, please inquire separately.

Accessories (Order Separately)

Protective Tube (Protects the Fiber.)

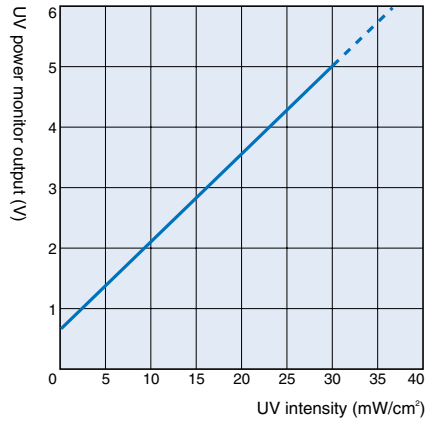
Item	Model	F39-FU1M
Shape		
Ambient temperature		-40° to 150°C for operating or storage Fiber inserted inside must be used within its operating temperature range.
Ambient humidity		Operating: 35% to 85% RH, storage: 35% to 95% RH
Bending radius		30 mm min.
Tensile strength		Between tube and head connector or end cap: 1.5 Nm or less Tube: 2 Nm or less
Compression load		Tube: 29.4 N max.
Material	Head connector	Brass nickel plating
	End cap	Brass nickel plating
	Tube	Stainless steel (SUS304)

Characteristic data (typical)

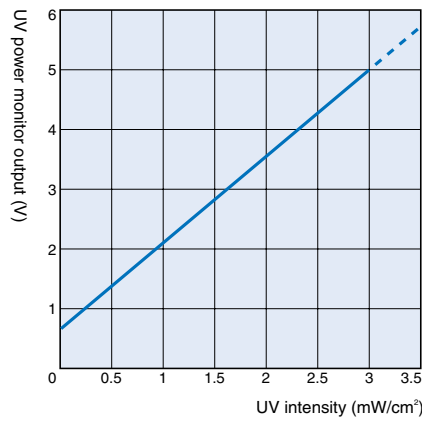
Built-in Amplifier Type

Output Characteristics

F3UV-A30 (output characteristics when output at 30 mW/cm² is set to 5 V)

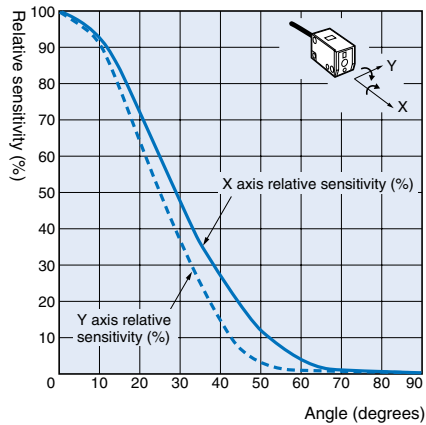


F3UV-A03 (output characteristics when output at 3 mW/cm² is set to 5 V)

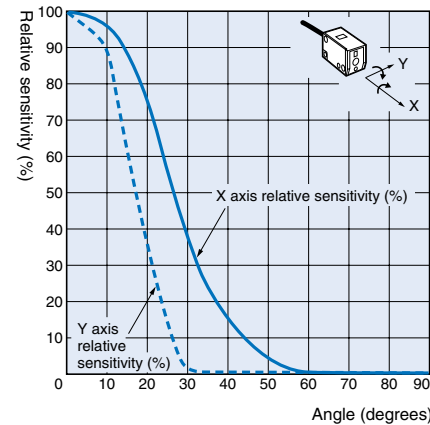


Angular Characteristics (Y-direction)

F3UV-A30/-A03



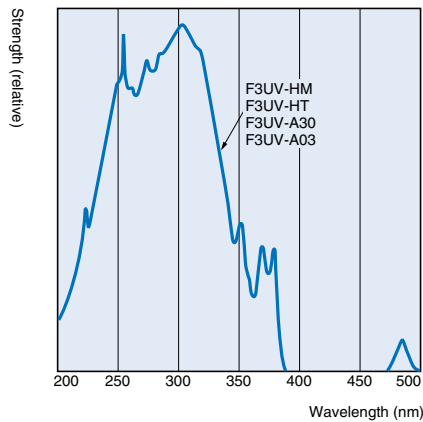
F3UV-A30/A03 + F39-HU1 (exposure cover option)



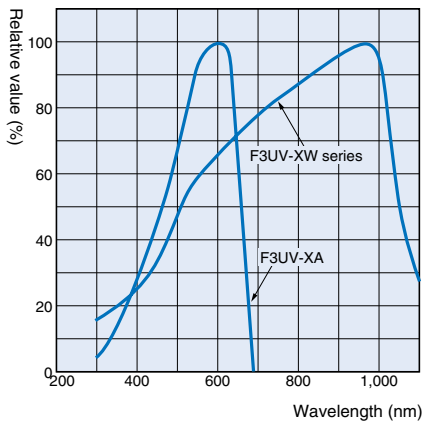
General

Sensitivity Characteristics

All F3UV Models



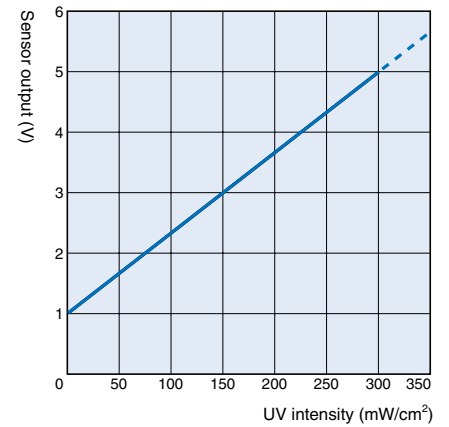
When used as illumination monitor



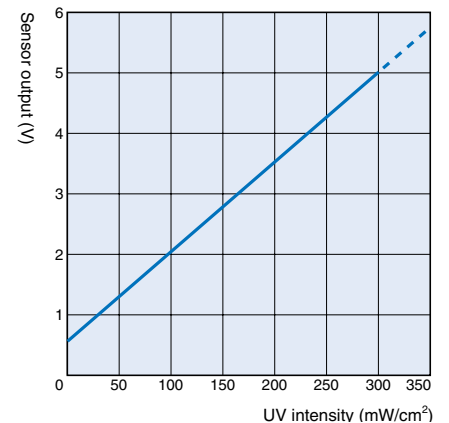
Optical Fiber Type

Output Characteristics

F3UV-XW□1 + F3UV-HM + F32-300 (output characteristics at 300 mW/cm² when sensitivity is set)

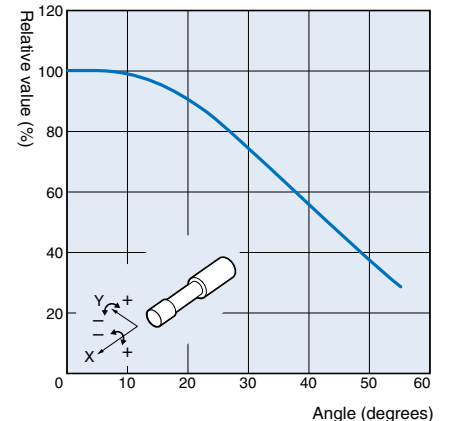


F3UV-XA + F3UV-HM + F32-300 (output characteristics at 300 mW/cm² when sensitivity is set)



Angle characteristics (Y direction)

F3UV-HM/-HT

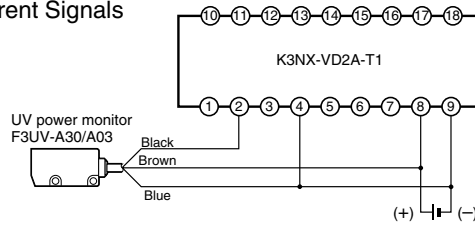


Note: X-direction output fluctuation is ±10% F.S. or less through 360° revolution

Connected with controller

Built-in Amplifier Type

Analog Indications such as Voltage or Current Signals



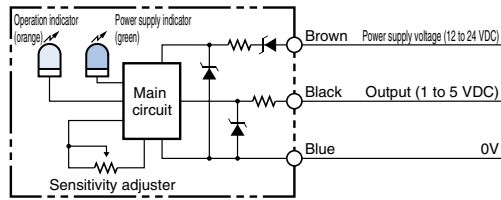
Input/output stage circuit schematic

Built-in Amplifier Type

Optical Fiber Type

F3UV-A30, F3UV-A03

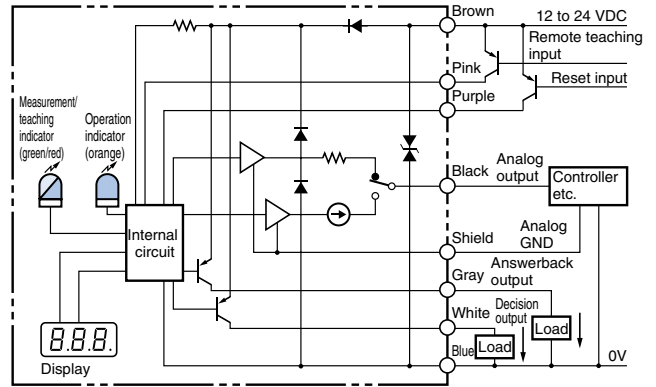
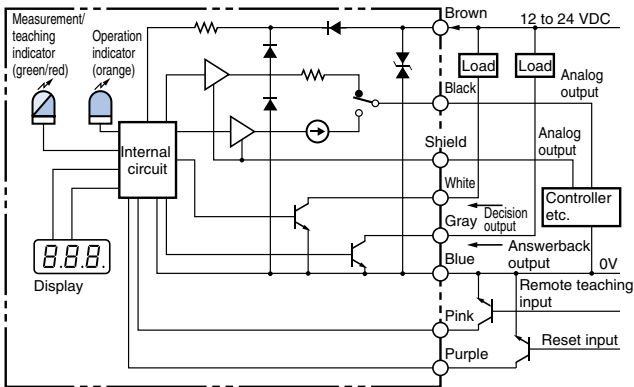
F3UV-XA



Optical Fiber Type

F3UV-XW11 (NPN output)

F3UV-XW41 (PNP output)



Part Names/Functions

Optical Fiber Type

- F3UV-XW11/XW41
- F3UV-XA

Measurement/teaching indicator:
 Illuminated green: Teaching OK
 RUN
 Flashing red : Teaching error
 Illuminated red: Start light intensity integration

Operation indicator:
 Illuminated orange: Judgement output ON

Processing mode switch:
 • Light intensity monitor mode
 TEACH: Zero point setting/ Sensitivity setting
 ADJ: Threshold adjustment
 RUN: Measure light intensity
 • Light intensity integral mode
 TEACH: Start/Stop integration
 RUN (ADJ): Light intensity integral

Output selection switch:
 I OUT: Current output (4 to 20 mA)
 V OUT: Voltage output (1 to 5 V)

Operation mode switch:
 MON: Light intensity monitor mode
 ITG: Light intensity integral mode

Fiber lock

Digital display:
 (Display % value and HI/LO)

Sensitivity setting/threshold up
 • Light intensity monitor mode (MON)
 TEACH: Sensitivity setting
 ADJ: Threshold adjustment (Up button)

Sensitivity setting/threshold down
 • Light intensity monitor mode (MON)
 TEACH: zero point setting
 ADJ: Threshold adjustment (Down button)

Light intensity monitor mode (MON)
 TEACH: zero point setting
 ADJ: Threshold adjustment (Down button)

Light intensity integral mode (ITG)
 TEACH: Stop integration

Power supply indicator (green):
 Light up by power on

Operate indicator (orange):
 Analog output value lights up by 4 to 5 V.

Sensitivity adjuster:
 Adjustment of sensitivity

Memory board:
 Indicate sensitivity adjuster position

Functions

Name	Functions
Light monitor function (with current/voltage output switch function)	Displays the digital (%) value corresponding to the incident light intensity and outputs the analog and judgement outputs. Analog output
	Decision output
Light intensity integration function (with current/voltage output switch function)	Calculates the light intensity integral value (I) from the incident light intensity (P) and time (T) using the following equation: $I = P \times T$. Also outputs the integral's analog output simultaneously and displays the digital (%) value. (Output ON at 100%.)
Remote teaching function	In light monitor mode or light intensity integration mode, teaching is performed by pulse signal input.

Built-in Amplifier Type

- F3UV-A30/A03

Operate indicator (orange):
 Analog output value lights up by 4 to 5 V.
Power supply indicator (green):
 Light up by power on.

Sensitivity adjuster:
 Adjustment of sensitivity

Functions

Name	Functions
Display function	P indicator Lit green when power supply is ON.
	Operation indicator Lit orange when the analog output is between 4 and 5 V.
Output function	Outputs voltage proportional to incoming light intensity. (Offset voltage of 0.2 V or higher)
Sensitivity adjustment function	Sensitivity can be set to the desired level with this one-turn adjuster.

Operation

● F3UV-A30/A03

Sensitivity adjustment method

During initial setup or when UV light source is replaced, adjust the analog output to 4 to 5 V as follows.

(Sensitivity adjustment)

After installing the sensor, adjust the sensitivity with the sensitivity control.

When the analog output is within the range of 4 to 5 V, the orange operation indicator lamp illuminates. Once it illuminates, fine adjust the output to the required voltage.

(If the UV light intensity is too high)

If the analog output is 5.0 V or higher when the sensitivity control is set to MIN (all the way to the left), the UV light intensity exceeds the sensor specification. Either use the optional F39-HU1 Exposure Cover, or move the sensor away from the UV lamp.

(If the UV light intensity is too low)

If the analog output is 5.0 V or lower when the sensitivity control is set to MAX (all the way to the right), the UV light intensity is lower than the sensor specification. Move the sensor closer to the UV lamp.

● F3UV-XW11/XW41

Basic Operating Procedures

- (1) Install the Amplifier Unit.
- (2) Connect the Fiber Unit to the Amplifier Unit.
- (3) Turn ON the power supply.
- (4) Select an operating mode with the operation mode switch. (Light intensity monitor mode or light intensity integral mode)
- (5) When using the analog output, select current or voltage output with the output selection switch.
- (6) Set the processing mode switch to TEACH and perform the teaching operation.
 - Light Intensity Monitor Mode
Perform the zero-point setting when the indicator is not lit and make the sensitivity setting when the indicator is lit. (Perform the sensitivity setting after the temperature has stabilized.)
 - Light Intensity Integral Mode
Use the start setting at the start of illumination and the stop setting when completed.
Teaching can be performed by pressing the buttons or with codes.
- (7) When changing the threshold value in light intensity monitor mode, set the processing mode switch to ADJ and adjust the threshold value. The judgement output will go ON if the light intensity is below the threshold value. The threshold value is set to 50 at the factory.

- (8) Set the processing mode switch to RUN to start measurement. In light intensity integral mode, start integration with the Reset input.

For detailed operation procedures, see the product manual.

● F3UV-XA

Sensitivity adjustment method

During initial setup or when UV light source is replaced, adjust the control output to any value between 4 and 5 V using the sensitivity control. After that, you can monitor weakening of the UV light source intensity by monitoring the control output value.

(Sensitivity adjustment)

After installing and securing the sensor, adjust the sensitivity with the sensitivity control. When the control output value is within the range of 4 to 5 V, the orange operation indicator lamp illuminates. (The sensor output goes up to approximately 6 V, and thus the operation indicator lamp does not illuminate if the sensitivity is too high.) Adjustment is easier if you verify that the operation indicator lamp is illuminated and then fine-adjust the sensitivity to the desired value while viewing the voltmeter display.

(If the UV light intensity is too high)

If the analog output is 5.0 V or higher when the sensitivity control is set to MIN (all the way to the left), or if the analog output does not decrease when the sensor is moved away from the UV lamp, the UV light intensity exceeds the sensor specification. Move the sensor further away from the UV lamp

(If the UV light intensity is too low)

If the analog output is 5.0 V or lower when the sensitivity control is set to MAX (all the way to the right), the UV light intensity is lower than the sensor specification. Move the sensor closer to the UV lamp.

Precautions

Important

Be sure to observe the precautions listed here. These precautions are essential for safe operation.

- (1) Do not disassemble, repair, or modify this product.
- (2) Do not short-circuit the two ends of the load.
- (3) Do not install the amplifier unit in a location where it will be exposed to ultraviolet light.

Correct Use

F3UV general

Wiring Considerations

Connection

- (1) Ensure that the power supply voltage is below the maximum voltage before turning the power ON.
- (2) Ensure that the terminal polarity and wiring are correct.
- (3) Use a cable with 0.3 mm² or greater wires and which is no more than 5 m in length, and test operation before using.

Power Supply

Do not use the system until 1 second has elapsed after turning on the power and it is in a detection-capable state. If the F3UV and the unit on which it is installed are connected to separate power sources, be sure to turn on the F3UV power first.

During use

Mounting the sensor

Ultraviolet light is harmful. Ensure the UV lamp is off when you install it.

Sensitivity setting

Temperature drift may cause the analog output value to change. If the temperature is rising, wait until it has stabilized sufficiently to set the sensitivity.

Output characteristics

If the analog output is not proportional to the ultraviolet illuminance of another manufacturer's illuminance meter, the following problems are possible.

- (1) If the distance between the lamp and the sensor was changed to adjust the ultraviolet illuminance, the values sometimes differ due to differing angles of view in the sensor receiver and in the other manufacturer's illuminance meter receiver.
- (2) If the illumination power of the UV lamp was changed to adjust the ultraviolet illuminance, accurate monitoring may not be possible due to insufficient stability of the UV lamp. Wait until the UV lamp has sufficiently stabilized and then perform the measurement.
- (3) If the temperature rises due to the UV lamp, wait until the sensor temperature stabilizes sufficiently and then perform the measurement.
- (4) If the sensor and the illuminance meter have different sized receiver areas, the values sometimes differ due to uneven illuminance on the receiver surface.

Miscellaneous

Cleaning

Do not use thinners. Use a soft cloth or blower brush to remove dust and dirt from the receiver window.

F3UV-A30/-A03

Mounting dimensions

(Installation strength)

Screws for mounting the sensor should be tightened to a torque of no more than 0.49 Nm.

(Protection against ultraviolet light)

The indicator lamps and cables on the sensor are not protected against ultraviolet light. If the indicator lamps and cables will be exposed to ultraviolet light, use the F39-HU2 and F39-CU1 to protect these parts.

Use protective gear if ultraviolet light will directly enter your field of vision or shine on your skin while mounting and adjusting the sensor.

F3UV-XW11/XW41/XA

Mounting

Mounting procedure

(1) Mounting strength * The torque for tightening screws when installing the sensor should be no more than 0.49 Nm.

(2) Using a DIN rail

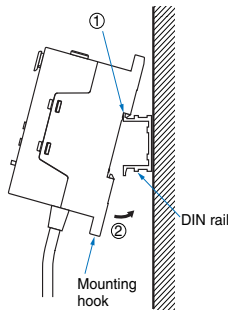
(Mounting)

1. Hook the top of the Unit onto the DIN Track.
2. Snap the bottom of the Unit onto the DIN Track.

Note: Do not reverse steps 1 and 2.

(Removal)

When removing the Unit from the DIN Track, pull the mounting hook forward to release it.



*F3UV-XW11/XW41 only

Protection against ultraviolet light

This amplifier is not protected against ultraviolet light.

Do not install the amplifier unit in a location where it will be exposed to ultraviolet light.

Fiber Unit/Base Unit

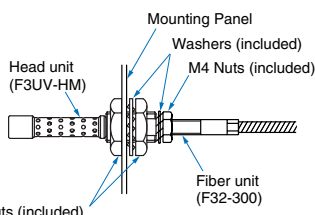
Mounting

Mounting the head unit when using as an ultraviolet power monitor

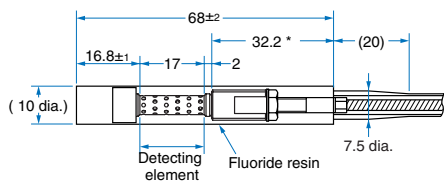
When installing the head unit, turn off the ultraviolet light and install in safe conditions.

The torque for tightening screws on the fiber unit should not exceed 0.78 Nm.

(F3UV-HM)



(F3UV-HT)



* When using mounting bracket, please use within this dimensions.

Mounting the fiber unit when using as an illumination monitor

As with a regular fiber unit, attach using an M4 locking nut.

When connecting to an amplifier unit

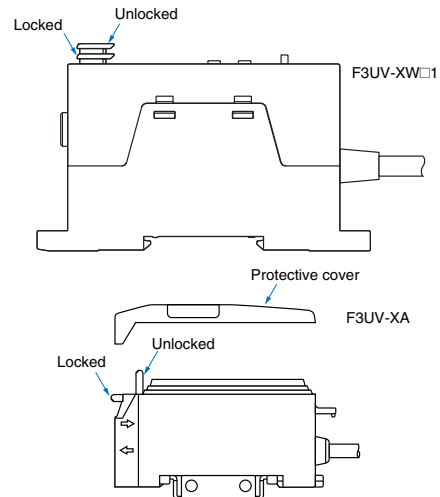
The quality of the connection between the Fiber Unit and Amplifier Unit has a major impact on the operating characteristics, so be sure to connect these Units securely.

(1) Cutting the Fiber (F32-70 only)

- Insert the fiber into the hole of the cutting tool and set the tool at the desired length.
- Press down the blade and cut the fiber. Do not stop when the fiber is only partially cut; make one clean cut
- Once a hole has been used to cut a fiber, do not use that hole again. The cut surface may not be clean enough and the detection characteristics may be degraded.

(2) Installing the Fiber

With the lock button in the release position, insert the fiber into the Unit and press the button until you hear a click. This click is the sound of the fiber being locked.



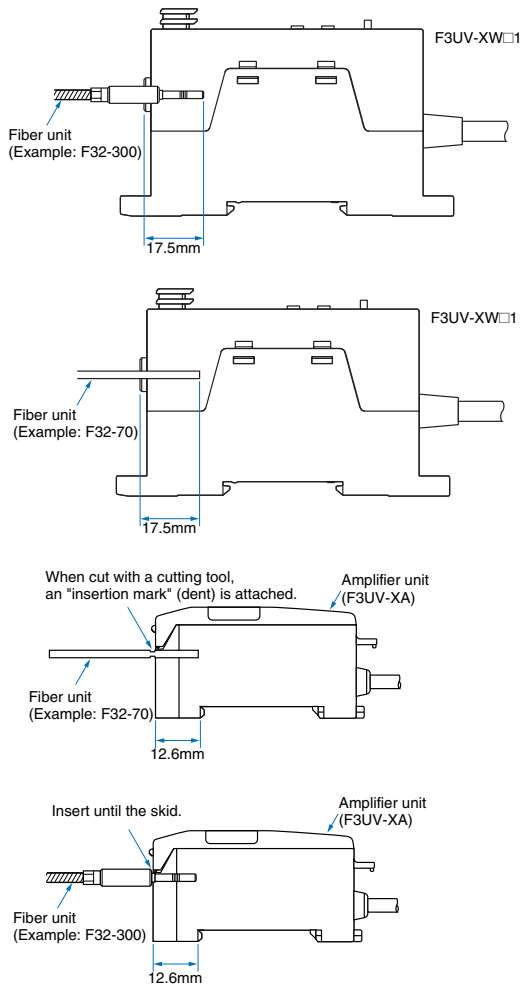
(3) Fiber removal

Press the lock button again. The lock will be released, the lock button will pop up, and it will be possible to remove the fiber.

Do not force the lock button up by pulling on it. (To maintain the fiber's characteristics, check whether the lock is out of place.)

(4) Fiber Insertion Location

When inserting the Fiber Unit into the Amplifier Unit, always insert the Fiber Unit completely as shown in the following diagram.



(5) Fiber Unit Installation/Removal Precautions

Install and remove the Fiber Unit only when the ambient temperature is between -40 and 40°C.

(6) Protecting the Fiber Unit

If the outer sheathing of a Fiber Unit other than the F32-300 is exposed to UV light, protect the fiber by covering it with the F39-FU1M Protective Tube.

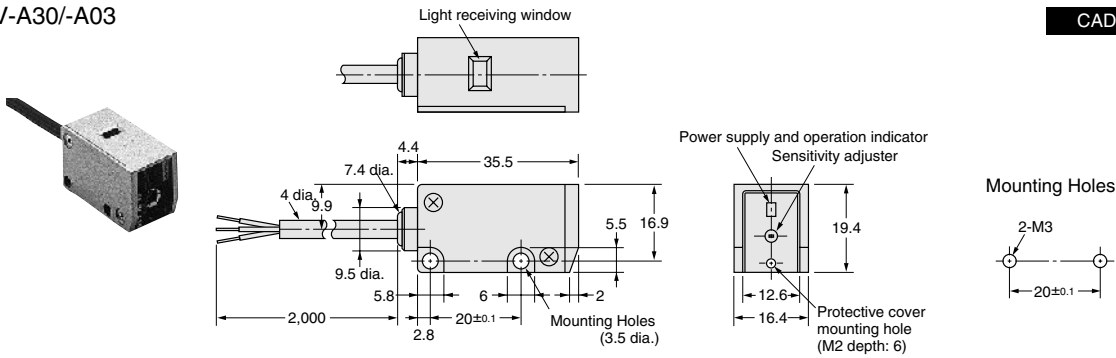
Dimensions (Unit: mm)

Built-in Amplifier Type

Sensors

F3UV-A30/-A03

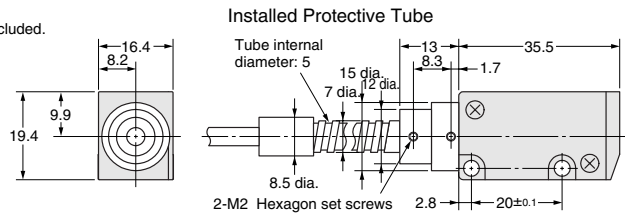
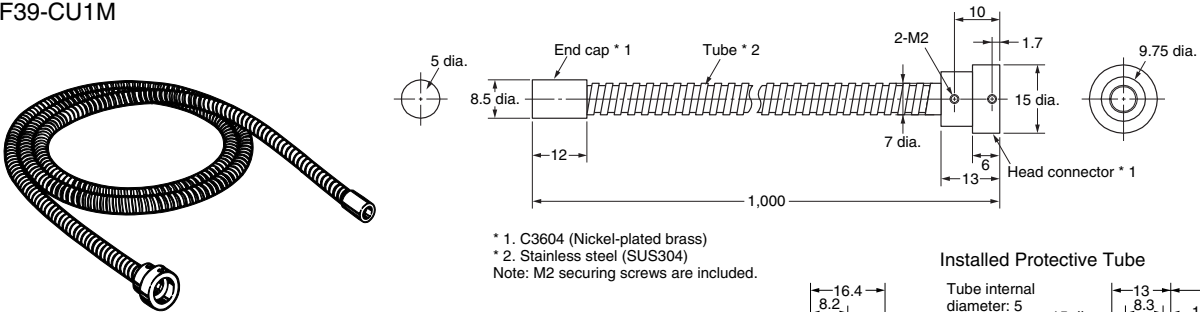
CAD file F3UV_01



Accessories (Order Separately)

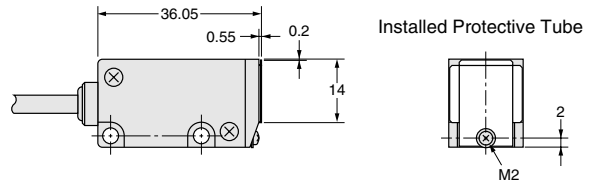
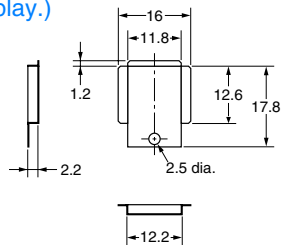
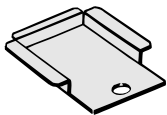
Protective Tube (Protects Cord.)

F39-CU1M



Protective Cover (Protects the display.)

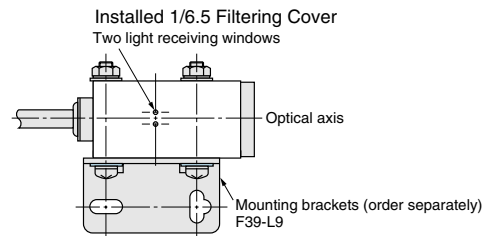
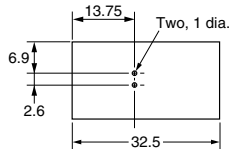
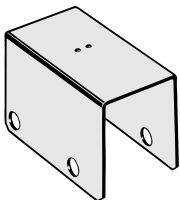
F39-HU2



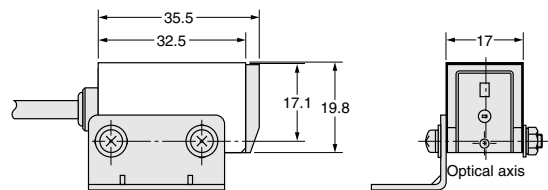
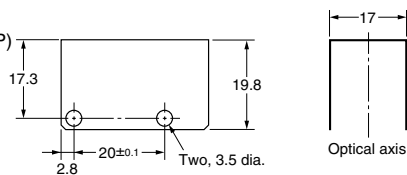
Material: Stainless steel (SUS304-CSP)
t = 0.2

1/6.5 Filtering Cover

F39-HU1



Material: Stainless steel (SUS304-CSP)
t = 0.2



Mounting Brackets

Optical Fiber Type

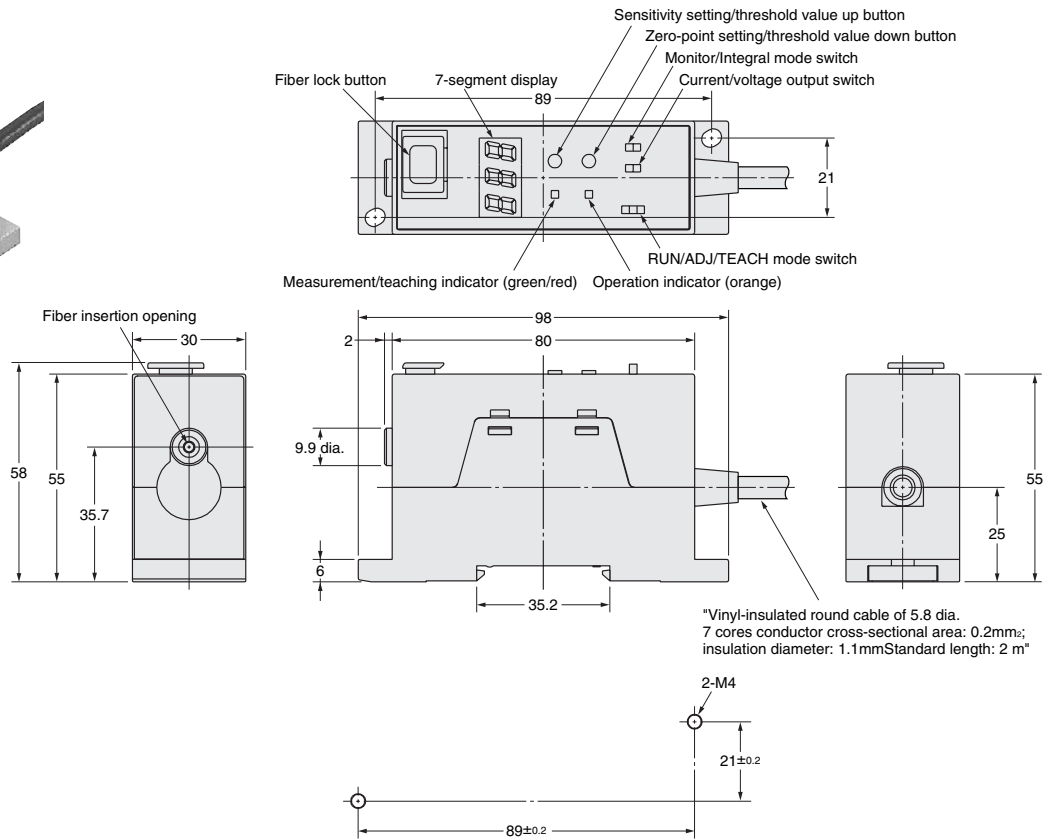
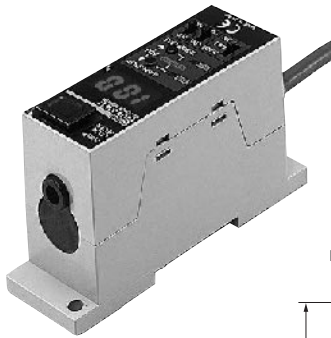
Sensors

Amplifier Units

F3UV-XW11/XW41

CAD file F3UV_02

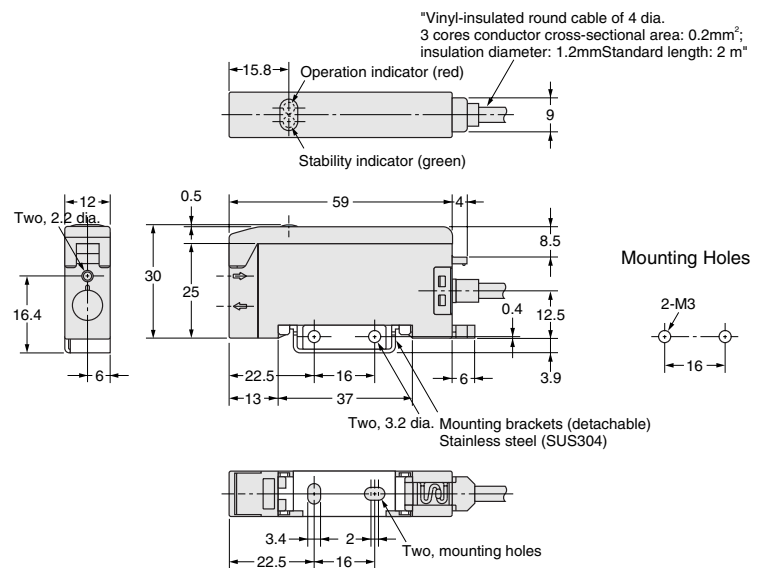
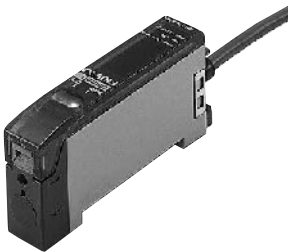
F3UV



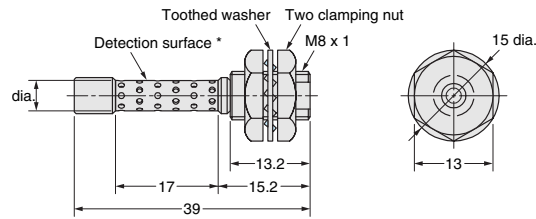
Amplifier Units

F3UV-XA

CAD file E3X_01



Head Unit
F3UV-HM

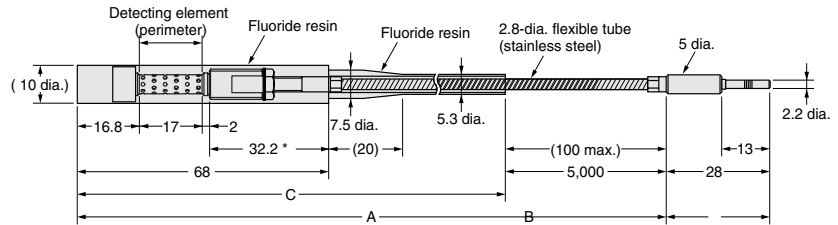


CAD file F3UV_03

* Material: Stainless steel (SUS303)

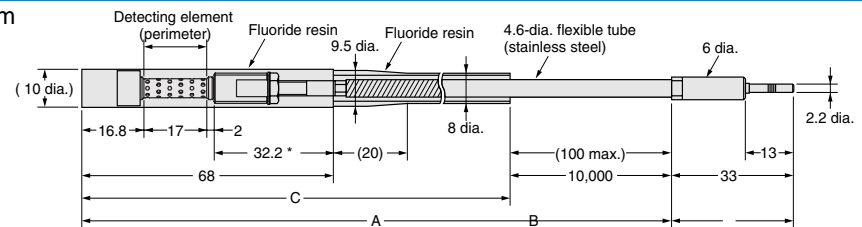
Head Unit

F3UV-HT 5m



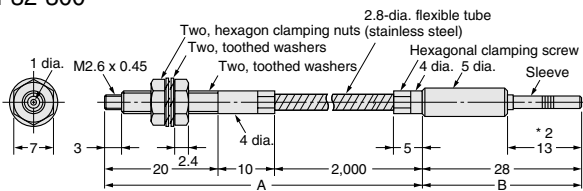
* When using mounting bracket, please use within this dimensions.
 Note 1. Heat resistance temperature is 150°C for part A and 110°C for part B (part inserted in unit).
 2. Protective structure is IP67 only for part C (fluororesin part)

F3UV-HT 10 m



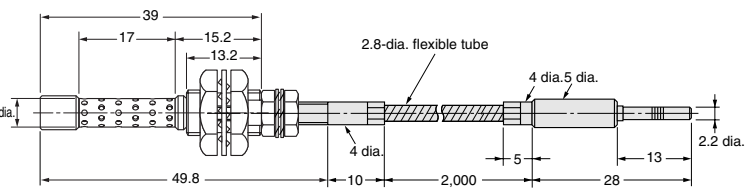
* When using mounting bracket, please use within this dimensions.
 Note 1. Heat resistance temperature is 150°C for part A and 110°C for part B (part inserted in unit).
 2. Protective structure is IP67 only for part C (fluororesin part)

Fiber Units
F32-300



Dimensions when F3UV-HM and F32-300 are connected

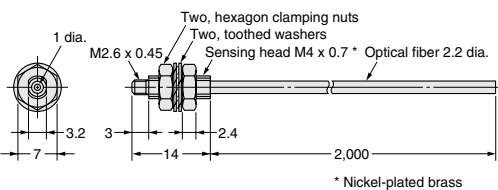
CAD file E32_47



* 1. Material: Stainless steel (SUS303)

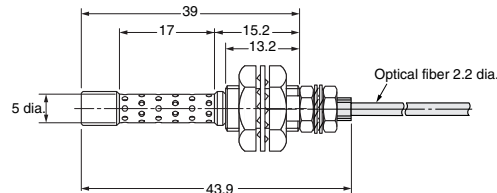
Note: Heat resistance temperature is 300°C for part A and 110°C for part B (part inserted in unit). However, take care that parts inserted in unit (parts marked are within operating temperature range of amplifier.

Fiber Units
F32-70



Dimensions when F3UV-HM and F32-70 are connected

CAD file E32_50



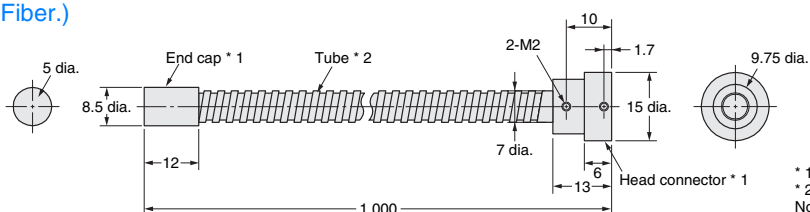
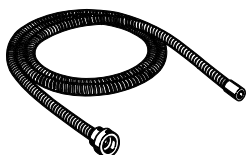
* Nickel-plated brass

Note: indicates that free-cutting is possible. Free-cutting is not possible on units that are not marked with .

Accessories (Order Separately)

Protective Tube (Protects the Fiber.)

F39-FU1M



* 1. C3604 (Nickel-plated brass)
 * 2. Stainless steel (SUS304)
 Note: M2 set screw attached

MEMO

A large grid of dashed lines for writing, consisting of 20 columns and 25 rows of squares.

F3UV

Sensor adjuster
E39-L150/E39-L151/E39-L93
 Cover fittings

Easy to install and easy to adjust. Sturdy sensor attachments that give you peace of mind.

- Applicable models: E3S-R, E3Z



Ordering Information

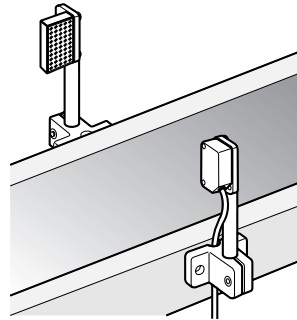
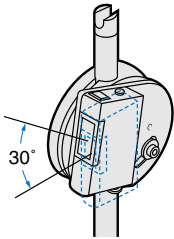
Shape	Name	Model	Applicable type				
			E3S-R1□	E3S-R6□	E3Z	E39-R1	E39-R3
	Sensor adjuster	NEW E39-L150	Vertical type only ●	Vertical type only ●	●	---	●
		NEW E39-L151	Vertical type only ●	Vertical type only ●	●	---	●
		E39-L93	●	●	●	Install with the E39-L96.	
	Attachments for the E39-L93 and E39-R1	E39-L96	Install with the E39-L93.			●	●
	Cover fitting for horizontal type	E39-L97	●	---	---	---	---
	Cover fitting for vertical type	E39-L98	---	●	●	---	---

Easy installation and adjustment on aluminum frames and rails of conveyors.

● Sensor Adjuster E39-L150/151

- ① Can be set to desired height.
Approximately 100-mm height (E39-L150)
Approximately 200-mm height (E39-L151)
- ② Left/right adjustment as desired.
* If vertical adjustment is required, use the E39-L93.

- ③ Reflective plate type (E39-R3) can also be installed.

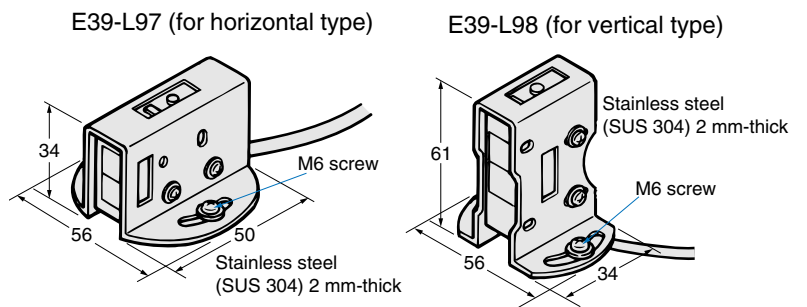
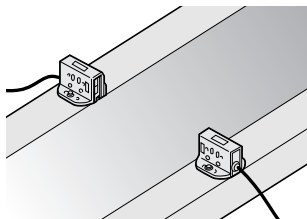


Sturdily protected sensor for long durability!

● Cover Fittings E39-L97/E39-L98

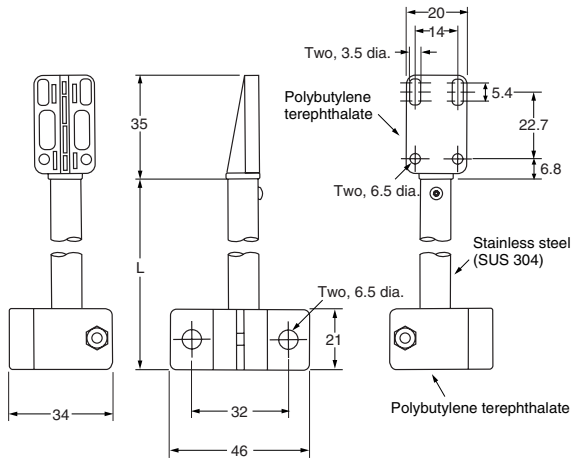
- ① M6 screws on both sides for strong installation.
- ② Stainless steel for excellent environmental

- ③ Models available for horizontal type (E39-L97) and vertical type (E39-L98).



Dimensions (Unit: mm)

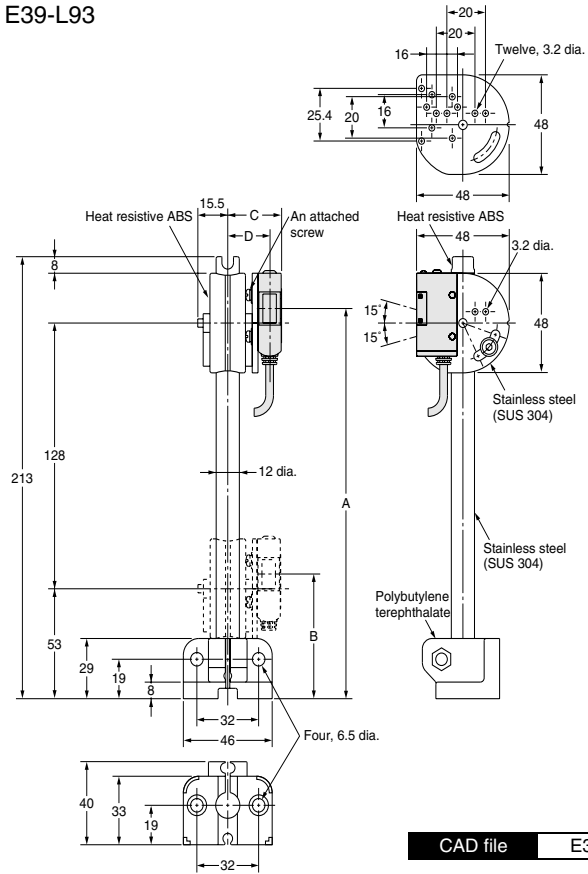
E39-L150
E39-L151



Model (typical example)	A	B	C	D	E	F
E3S-R vertical type	85.3	58	17.9	11.7	11.5	27.3
E3Z	84.5	47.5	16.3	10.9	10	37

Model	L
E39-L150	100
E39-L151	200

E39-L93

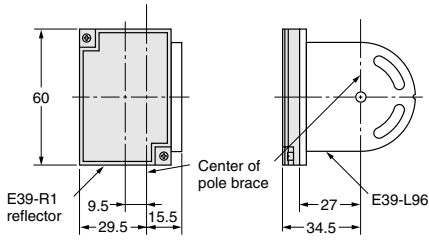


CAD file E39_13

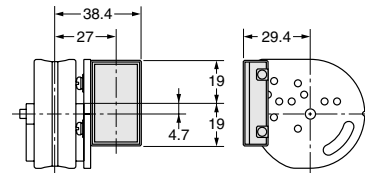
Model (typical example)	A	B	C	D
E3S-R vertical type	188	60	27.9	21.7
E3S-R horizontal type	195.3	67.3	27.9	21.7
E3Z	185.7	57.7	26.3	20.9

E39-R1 (Reflectors)
+
E39-L93

* E39-L96 is necessary.

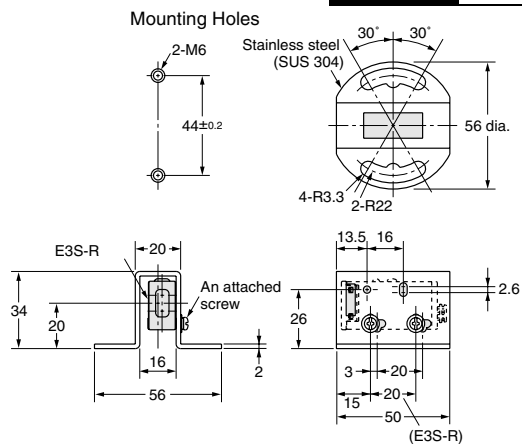


E39-R3 (Reflectors)
+
E39-L93



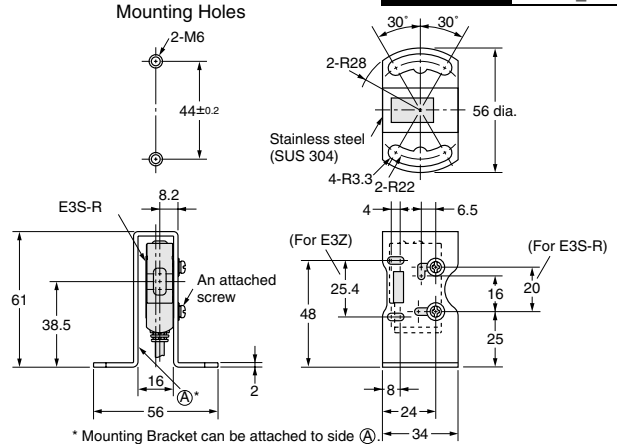
E39-L97 (for horizontal type)

CAD file E39_14



E39-L98 (for vertical type)

CAD file E39_15



* Mounting Bracket can be attached to side (A)

MEMO

A large grid of dashed blue lines for writing, consisting of 20 columns and 25 rows of squares.

E39-L150/E39-L151/E39-L93

Mounting Brackets
E39-L/F39-L
 Slit/reflective plate
E39-S/E39-R

Brackets list

* Applicable models that appear shaded come with the clamps indicated at left as accessories.

Model	Fitting materials	Count	Accessories			Applicable sensor (mounting pitch on sensor side)
			Description	Material	Count	
E39-L4	Iron, zinc plating	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Iron, zinc plating	2	E32-T16(20)
E39-L40	Iron, zinc plating	1	Phillips screws M4 x 25 (with spring and plain washers) Nut M4	Iron, zinc plating Iron, zinc plating	2 2	E3JK F3C-AL
E39-L43	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4)
E39-L44	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4)
E39-L54V	Stainless steel (SUS304)	1	---	---	-	E32-T54V
E39-L69	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3S-R1□(20)
E39-L70	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3S-R6□(20)
E39-L85	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C(25.4)
E39-L86	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C(25.4)
E39-L87	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C(25.4) E3S-CR62/67(25.4)
E39-L93	Stainless steel (SUS304)	1	Holder (upper) Holder (lower) Pipe Bolts M4 x 12 with hexagonal holes Bolts M4 x 30 with hexagonal holes Phillips screws M3 x 12 (with spring and plain washers) Spring washer M4 Plain washer M4 Nut M4	Heat-resistant ABS resin PBT (polybutylene terephthalate) Stainless steel (SUS304) Iron, nickel plating Iron, nickel plating Stainless steel (SUS304) Iron, nickel plating Iron, nickel plating Iron, nickel plating	1 1 1 2 1 1 1 1 3	E3Z(25.4) E3S-R1□/R6□(20)
E39-L94	Iron, zinc plating	2	Phillips screws M3 x 10 Nut M3	Iron, zinc plating Iron, zinc plating	4 4	E32-T16P(19)
E39-L96 * For installation of Sensor Adjuster E39-L93	Stainless steel (SUS304)	1	Phillips screws M3 x 6 (with spring and plain washers)	Iron, nickel plating	2	E39-R1
E39-L97	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3S-R1□(20)
E39-L98	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4) E3S-R6□(20)
E39-L102	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C (horizontal type) (25.4)

Model	Fitting materials	Count	Accessories			Applicable sensor (mounting pitch on sensor side)
			Description	Material	Count	
E39-L103	Stainless steel (SUS304)	1	Hexagon bolts M4 x 12 (with spring and plain washers)	Iron, zinc plating	2	E3S-C (vertical type) (25.4) E3S-CR62/67(25.4)
E39-L104	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4) E32-R21 (for installation of E39-R3) (25.4)
E39-L109	Stainless steel (SUS430)	1	---	---	-	E32-S15-□(13.2)
E39-L114	Stainless steel (SUS430)	2	Phillips screws M5 x 10	Iron, zinc plating	4	E3MC(28)
E39-L115	Stainless steel (SUS304)	1	Phillips screws M5 x 8 Slotted/Phillips screws M3 x 8	Iron, zinc plating Iron, nickel plating	4 2	E3MC
E39-L116	Stainless steel (SUS304)	1	---	---	-	E3T-S(9/15)
E39-L117	Stainless steel (SUS304)	1	---	---	-	E3T-S(9/15)
E39-L118	Stainless steel (SUS304)	1	---	---	-	E3T-S(9/15)
E39-L119	Stainless steel (SUS304)	1	---	---	-	E3T-F(8)
E39-L120	Stainless steel (SUS304)	1	---	---	-	E3T-F(8)
E39-L131	Stainless steel (SUS304)	1	Slotted/Phillips screws M4 x 25 Spring washer M4 Plain washer M4	Stainless steel (SUS304) Stainless steel (SUS304) Stainless steel (SUS304)	2 2 2	E3G
E39-L132	Stainless steel (SUS304)	1	Slotted/Phillips screws M4 x 25 Spring washer M4 Plain washer M4	Stainless steel (SUS304) Stainless steel (SUS304) Stainless steel (SUS304)	2 2 2	E3G
E39-L135	Stainless steel (SUS304)	1	Slotted/Phillips screws M4 x 35 Spring washer M4 Plain washer M4	Stainless steel (SUS304) Stainless steel (SUS304) Stainless steel (SUS304)	2 2 2	E3G
E39-L136	Stainless steel (SUS304)	1	Slotted/Phillips screws M4 x 35 Spring washer M4 Plain washer M4	Stainless steel (SUS304) Stainless steel (SUS304) Stainless steel (SUS304)	2 2 2	E3G
E39-L139	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12	Stainless steel (SUS304)	2	E3G-L1/L3
E39-L140	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12	Stainless steel (SUS304)	2	
E39-L142	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z(25.4)
E39-L143	Stainless steel (SUS304)	1	None	---	-	E3X-DA-N E3X-NA
E39-L144	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 12 (with spring and plain washers)	Stainless steel (SUS304)	2	E3Z
E39-L148	Stainless steel (SUS304)	1	None	---	-	E3X-DA-N E3X-NA

Model	Fitting materials	Count	Accessories			Applicable sensor (mounting pitch on sensor side)
			Description	Material	Count	
E39-L150	Stainless steel (SUS304)	1	Holder/bracket	PBT (polybutylene terephthalate)	1	E3Z, E3S-R, E39-R3
			Shaft (brace)	Stainless steel (SUS304)	1	
			Hexagon bolt	Stainless steel (SUSXM7)	1	
			Nut	Stainless steel (SUS304)	1	
			Phillips screw	Stainless steel (SUSXM7)	1	
			Slotted/Phillips screws	Stainless steel (SUS304)	2	
E39-L151	Stainless steel (SUS304)	1	Holder/bracket	PBT (polybutylene terephthalate)	1	E3Z, E3S-R, E39-R3
			Shaft (brace)	Stainless steel (SUS304)	1	
			Hexagon bolt	Stainless steel (SUSXM7)	1	
			Nut	Stainless steel (SUS304)	1	
			Phillips screw	Stainless steel (SUSXM7)	1	
			Slotted/Phillips screws	Stainless steel (SUS304)	2	
E39-L153	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 8 (with spring and plain washers)	Stainless steel (SUSXM7) Stainless steel (SUS304)	2	E3Z
F39-L9	Stainless steel (SUS304)	1	Slotted/Phillips screws M3 x 25	Iron, zinc plating	2	F3UV-A
			Plain washer M3	Iron, zinc plating	2	

Contact mounting plate list

* Applicable models that appear shaded come with the mounting plate at left as accessories

Model	Material	Count	Applicable type
E39-L60	PBT (polybutylene terephthalate)	1	E3S-R□6

Slit list

* Applicable models that appear shaded come with the slits indicated at left as accessories

Model	Slit width	Installation procedure	Applicable type
E39-S39	Width 1 x 20 mm	Seal type	E3JK-5□□
E39-S60	Width 0.5, 1 x 20 mm	Seal type	E32-T16
E39-S61	Width 0.5, 1, 2, 4 x 20 mm	Insertion type	E3S-CT□1
E39-S63	0.5 mm dia., 1 mm		E3T-ST1□
E39-S64	0.5 mm dia., 1 mm		E3T-FT1□
E39-S65A	0.5 mm dia.		E3Z-T□□
E39-S65B	1 mm dia.		
E39-S65C	2 mm dia.		
E39-S65D	Width 0.5 x 10 mm		
E39-S65E	Width 1 x 10 mm		
E39-S65F	Width 2 x 10 mm		

Reflectors list

Item	Name Model	Reflectors		Non-fogging reflector	Reflectors		
		E39-R1	E39-R1S	E39-R1K	E39-R2	E39-R6	E39-R10
Directional angle		30° min.*1			30° min.*2	30° min.	
Ambient operating temperature		-25° to 55°					
Ambient storage temperature		-40° to 70°C		-40° to 55°	-40° to 70°C		
Ambient operating humidity		35% to 85%				35% to 95%	
Ambient storage humidity		35% to 95%					
Protective structure		IEC 60529 IP67					
Accessories		---					

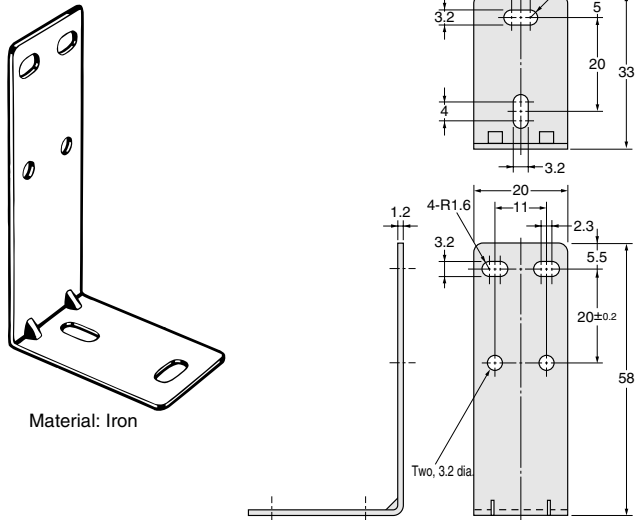
*1. 40° or higher for E3JK-R.

*2. 40° or higher for E3G-R.

Item	Name Model	Small reflector				Tape Reflector		
		E39-R9	E39-R3	E39-R4	E39-R37	E39-RS1	E39-RS2	E39-RS3
Directional angle		30° min.		2° to 20° min.	30° min.			
Ambient temperature		-25° to 55° C						
Ambient temperature		-40° to 70°C			0°C to 40°C			
Ambient operating humidity		35% to 95%	35% to 85%					
Ambient storage humidity		35% to 95%			35% to 85%			
Protective structure		IEC 60529 IP67						
Accessories		---	Clamps (with screws)	---	Phillips screws M3 x 3, spring washers M3, nut M3	---		

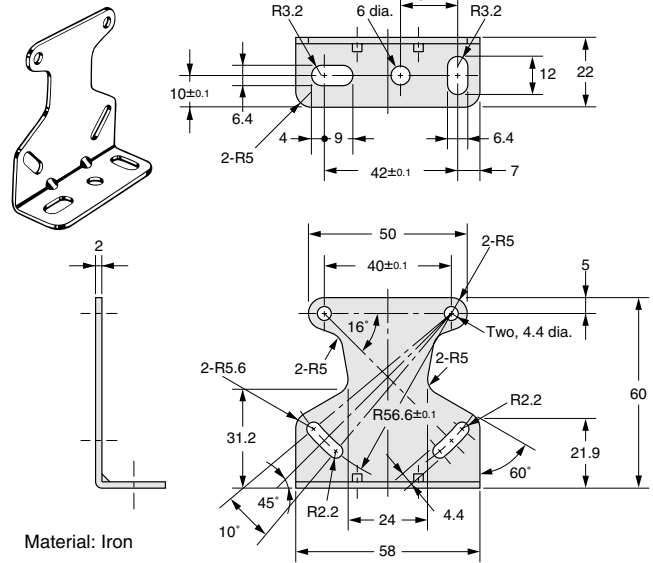
Mounting brackets dimensions (unit: mm)

E39-L4



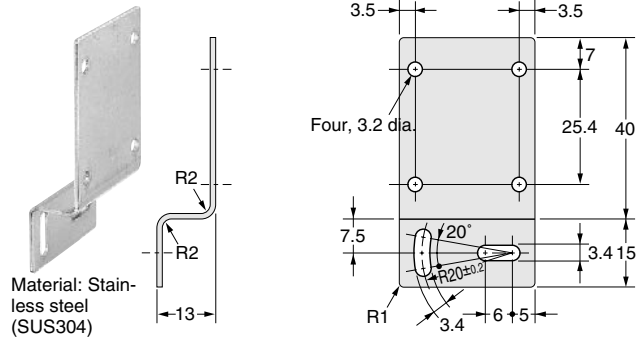
Material: Iron

E39-L40



Material: Iron

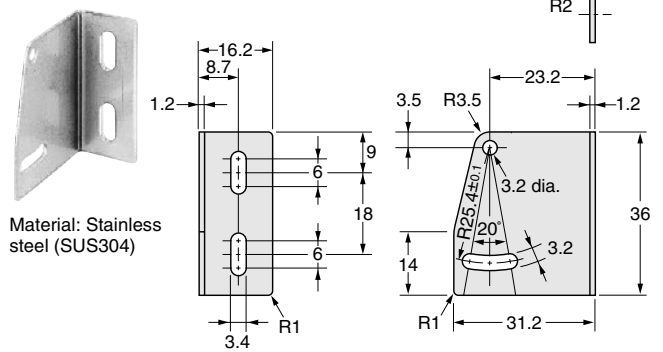
E39-L43



Material: Stainless steel (SUS304)

CAD file E39_32

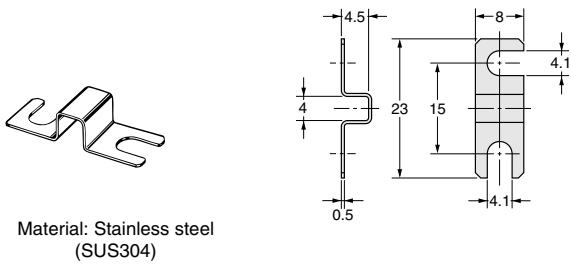
E39-L44



Material: Stainless steel (SUS304)

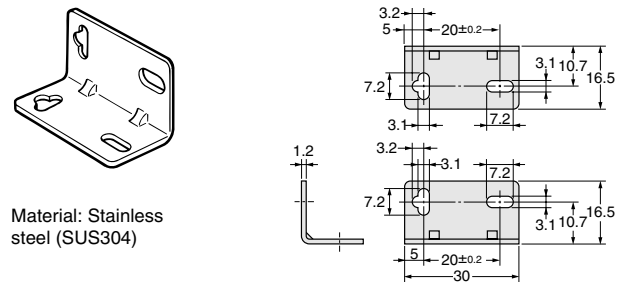
CAD file E39_33

E39-L54V



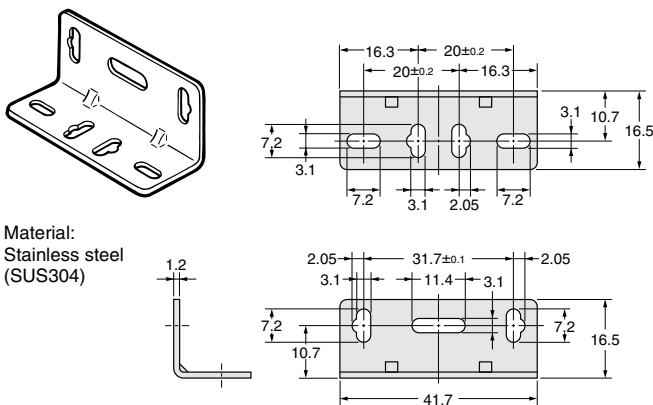
Material: Stainless steel (SUS304)

E39-L69 (for E3S-R1□)



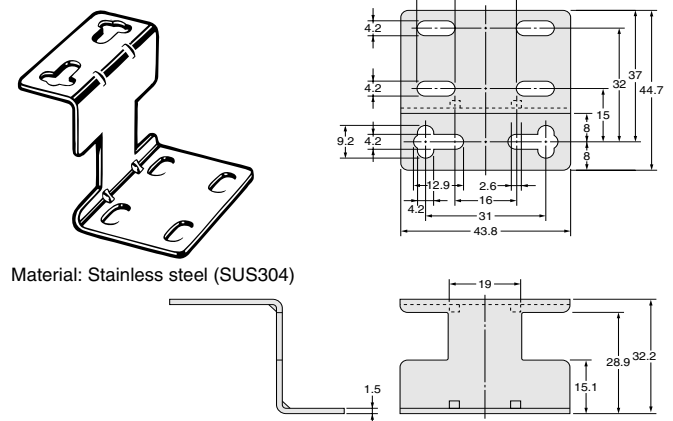
Material: Stainless steel (SUS304)

E39-L70 (for E3S-R6□)



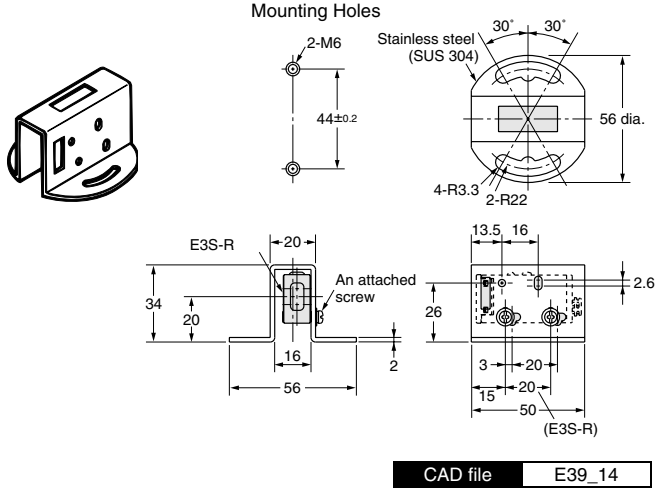
Material: Stainless steel (SUS304)

E39-L85

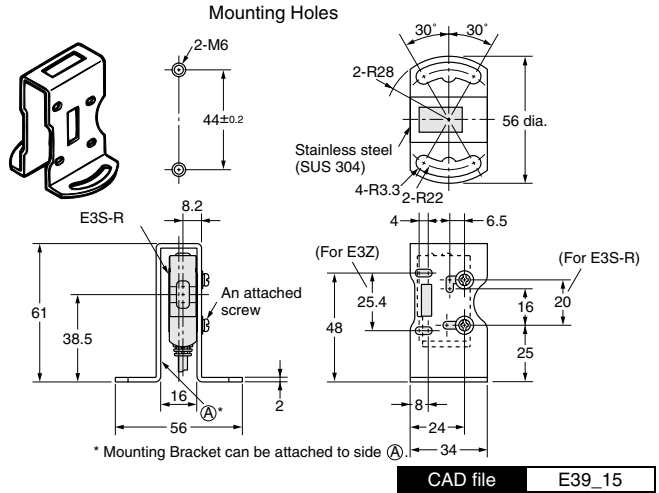


Material: Stainless steel (SUS304)

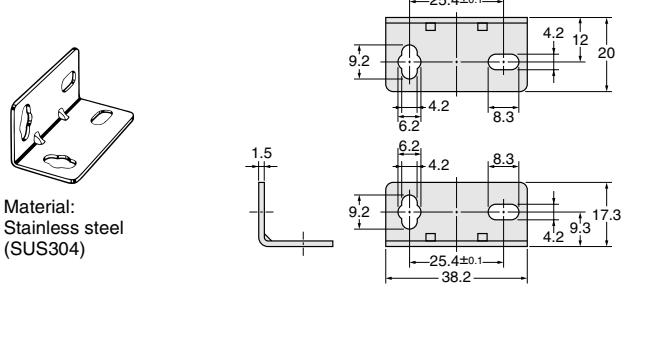
E39-L97



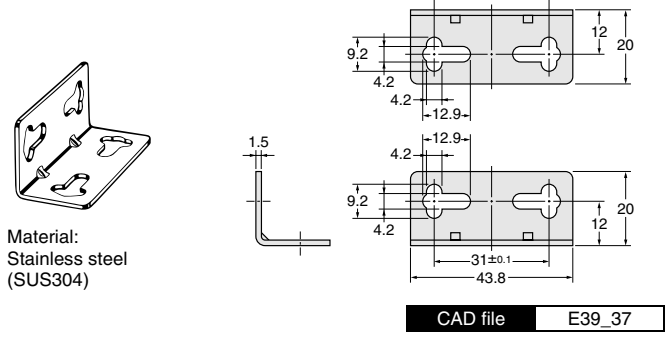
E39-L98



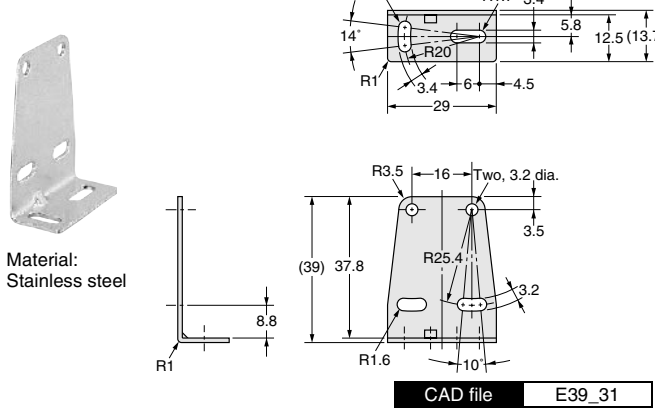
E39-L102



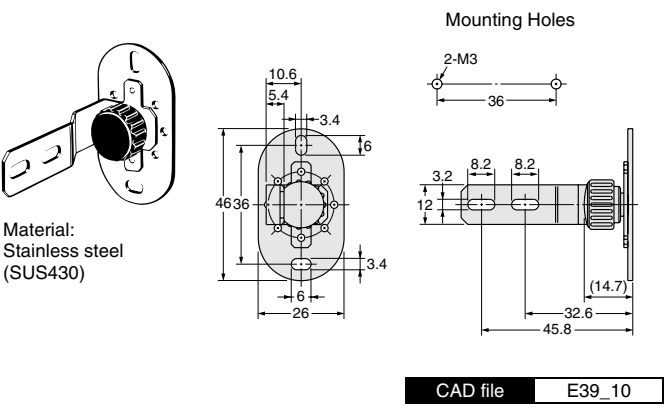
E39-L103



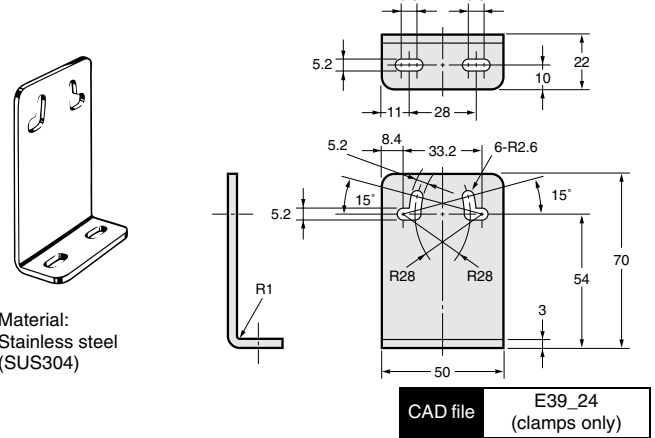
E39-L104



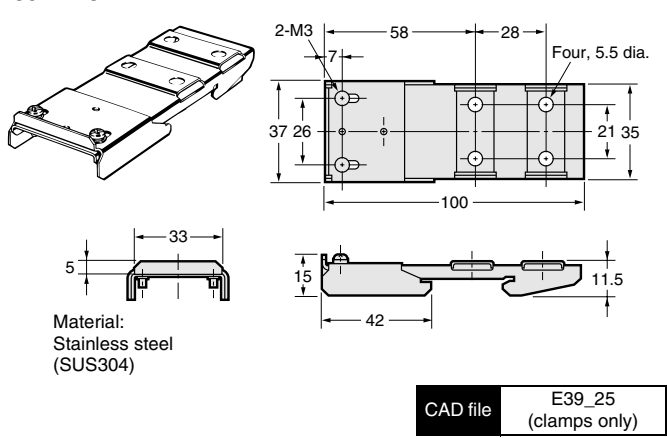
E39-L109



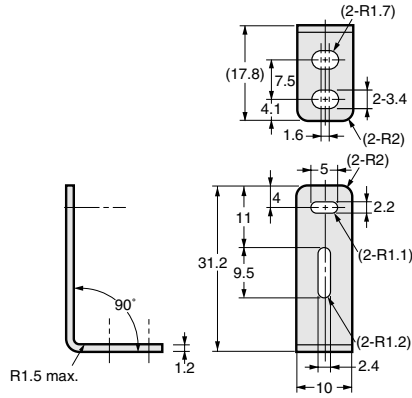
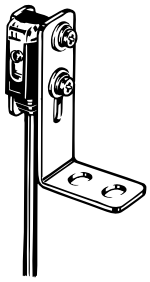
E39-L114



E39-L115



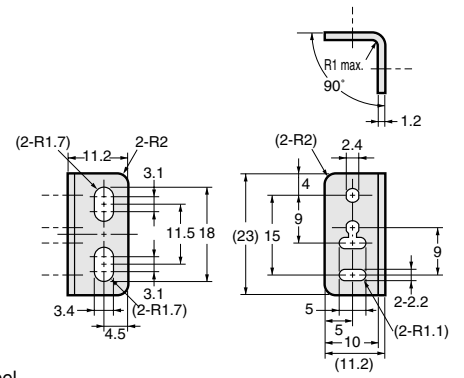
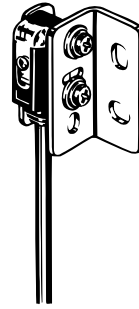
E39-L116



Material: Stainless steel (SUS304)
1.2 mm thick

CAD file E39_26

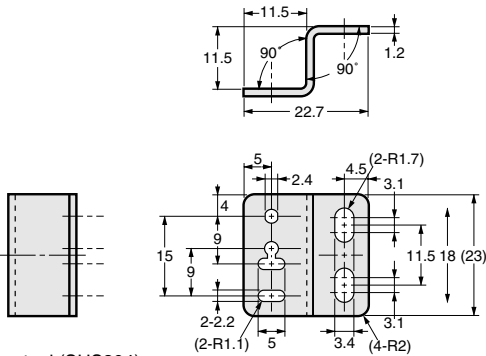
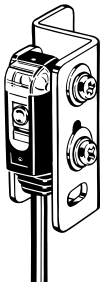
E39-L117



Material: Stainless steel (SUS304)
1.2 mm thick

CAD file E39_27

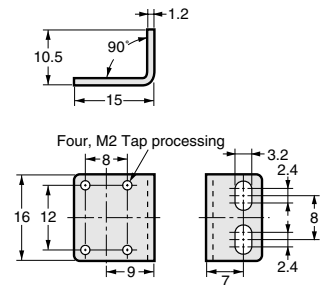
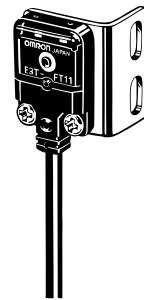
E39-L118



Material: Stainless steel (SUS304)
1.2 mm thick

CAD file E39_28

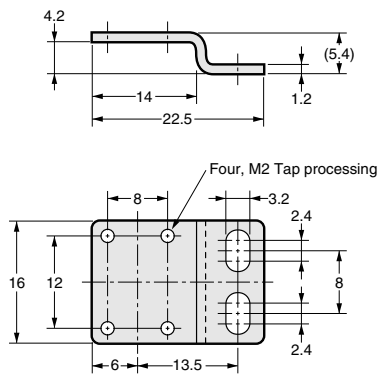
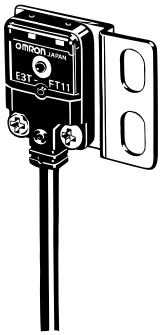
E39-L119



Material: Stainless steel (SUS304)
1.2 mm thick

CAD file E39_29

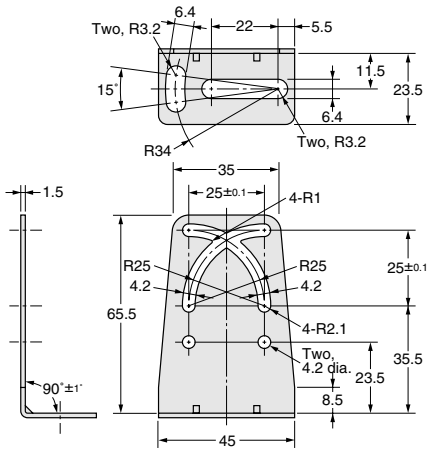
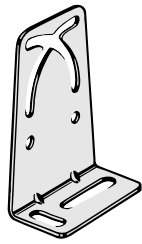
E39-L120



Material: Stainless steel (SUS304)
1.2 mm thick

CAD file E39_30

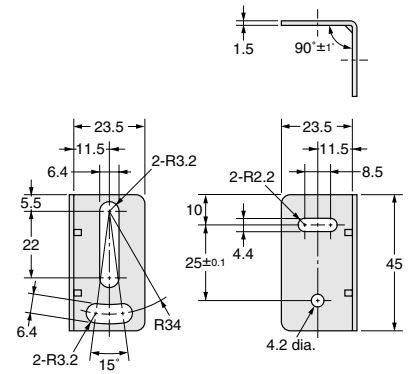
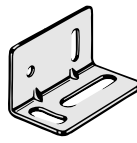
E39-L131



Material: Stainless steel (SUS304)

CAD file E39_39

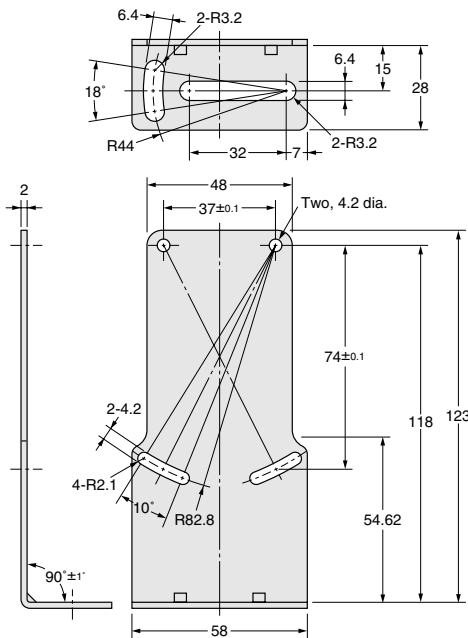
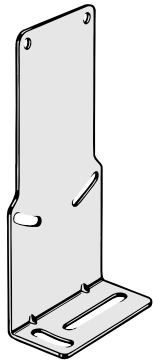
E39-L132



Material: Stainless steel (SUS304)

CAD file E39_40

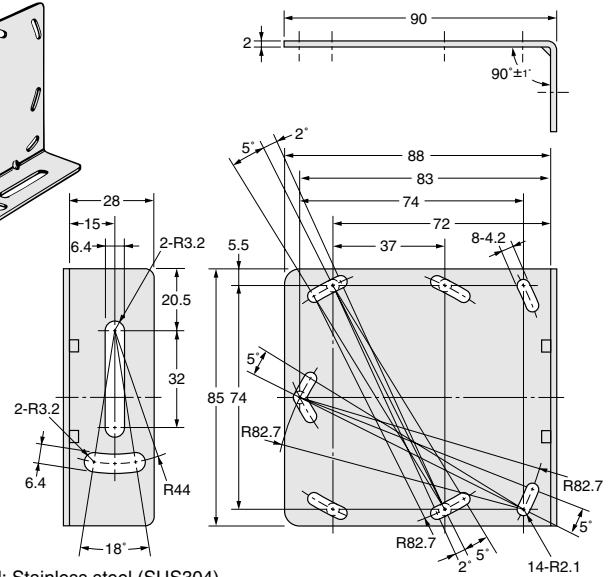
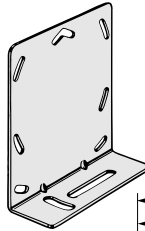
E39-L135



Material: Stainless steel (SUS304)

CAD file E39_42

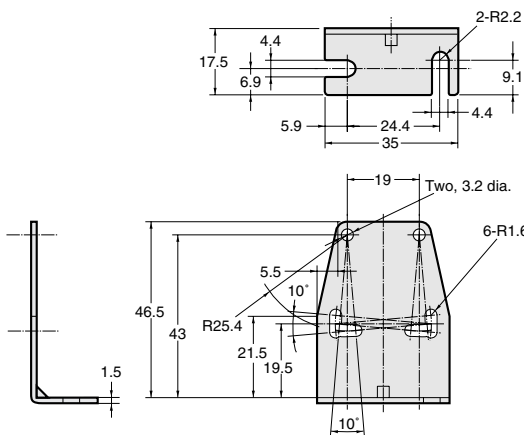
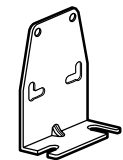
E39-L136



Material: Stainless steel (SUS304)

CAD file E39_43

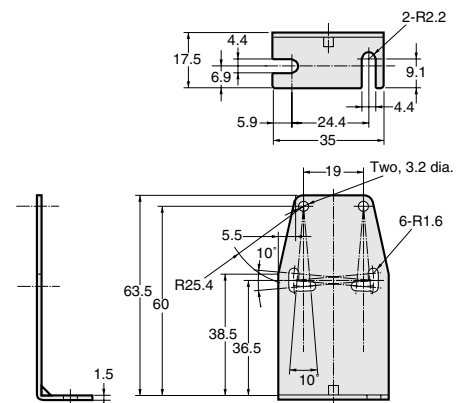
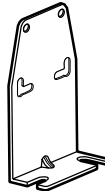
E39-L139



Material: Stainless steel (SUS304)

CAD file E3G_09 E3G_11

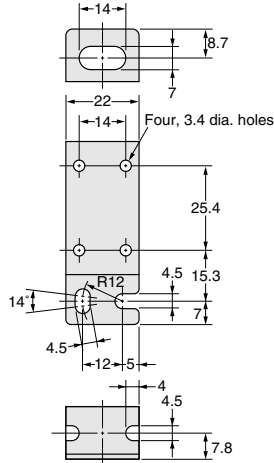
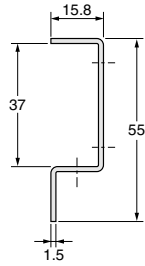
E39-L140



Material: Stainless steel (SUS304)

CAD file E3G_09 E3G_11

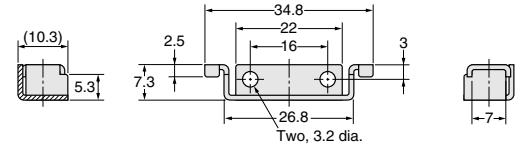
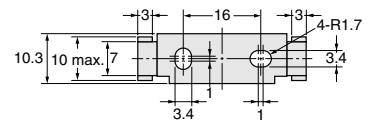
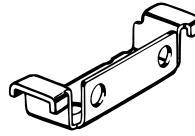
E39-L142



Material: Stainless steel (SUS304)

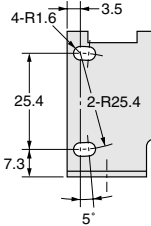
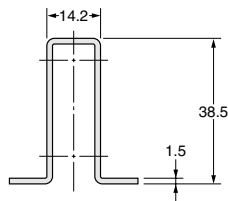
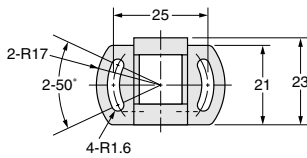
CAD file E39_49

E39-L143



Material: Stainless steel (SUS304)

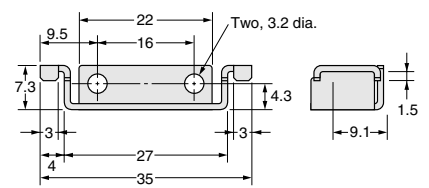
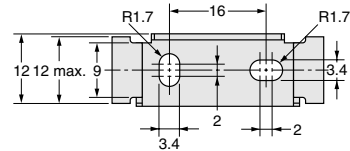
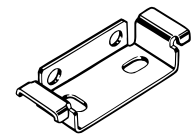
E39-L144



Material: Stainless steel (SUS304)

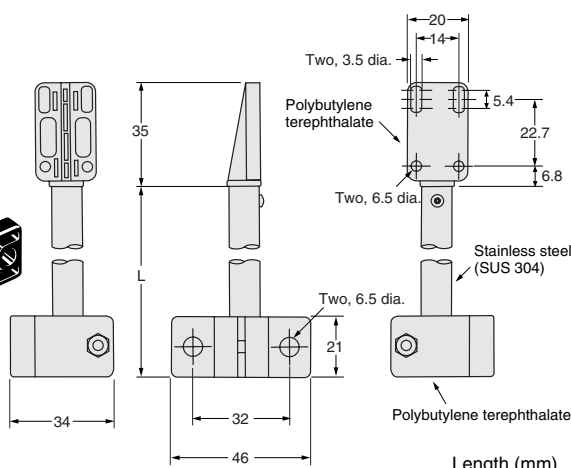
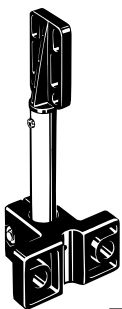
CAD file E39_50

E39-L148



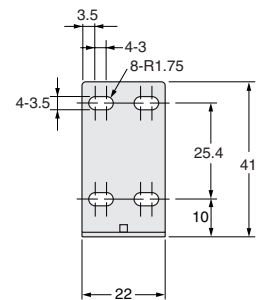
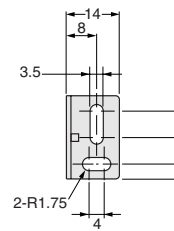
Material: Stainless steel (SUS304)

E39-L150
E39-L151

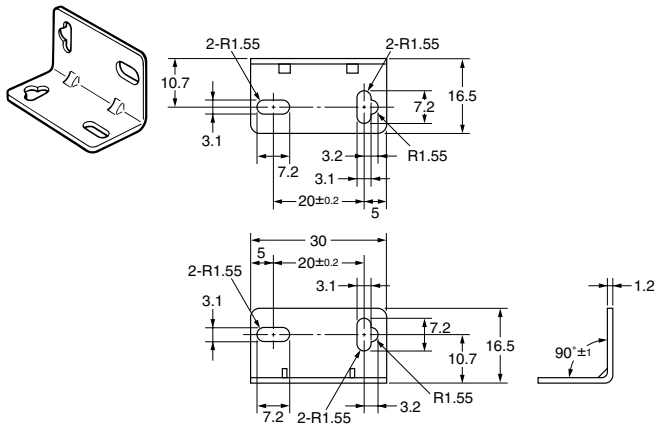


Model	L
E39-L150	65
E39-L151	165

E39-L153



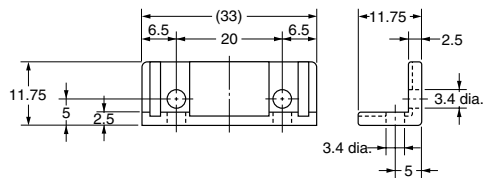
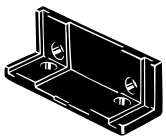
F39-L9



Material: Stainless steel (SUS304-CP)

Contact mounting plate (unit: mm)

E39-L60

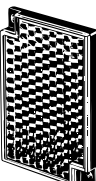


Material: PBT (polybutylene terephthalate)

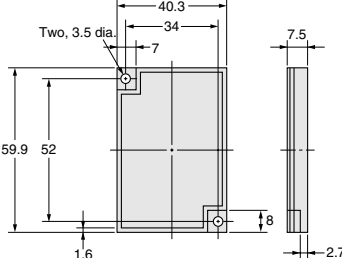
Reflectors dimensions (unit: mm)

E39-L/S/R F39-L

E39-R1
E39-R1S
E39-R1K *



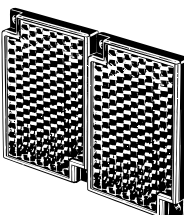
Material, reflective surface: acrylic
Rear surface: ABS



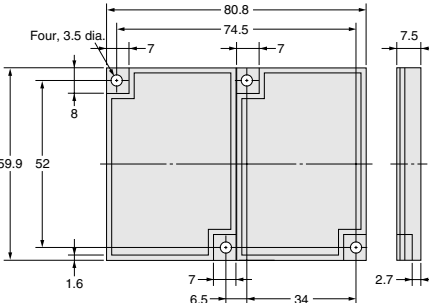
*E39-R1 only
Coating on reflective surface

CAD file E39_16

E39-R2


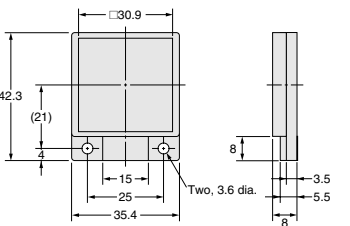


Material, reflective surface: acrylic
Rear surface: ABS




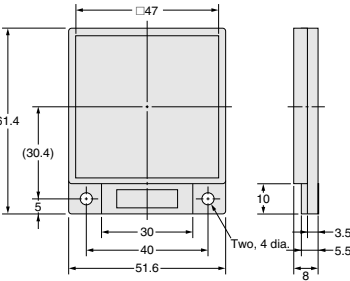
CAD file E39_17

E39-R9


Material, reflective surface: acrylic
Rear surface: ABS

E39-R10

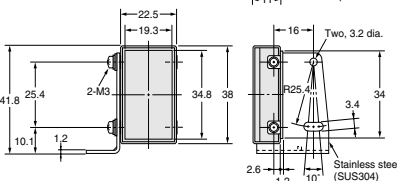



Material, reflective surface: acrylic
Rear surface: ABS

E39-R3




Material, reflective surface: acrylic
Rear surface: ABS

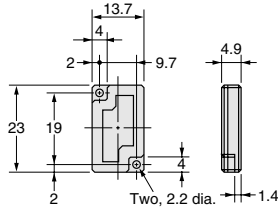


CAD file E39_18

E39-R4

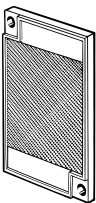


Material:
Reflective surface: acrylic
Rear surface: ABS

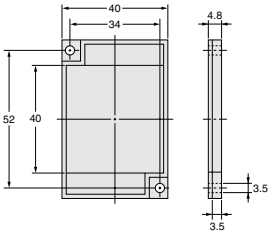


CAD file E39_23

E39-R6




Material, reflective surface: acrylic
Rear surface: ABS



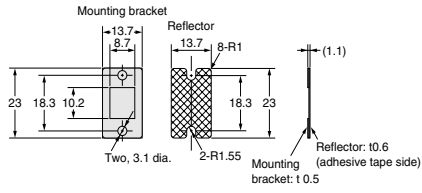
CAD file E39_36

E39-R37




Material:
Mounting plate: stainless steel (SUS301)
Reflective surface: acrylic

Note: The reflective plate and mounting plate (1) come as a set.

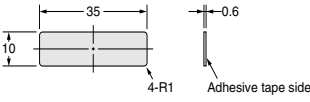


CAD file E39_23

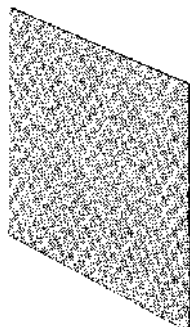
E39-RS1



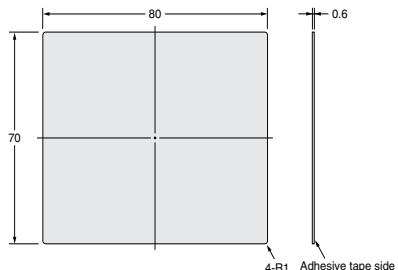
Material: Acrylics



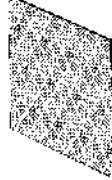
E39-RS3



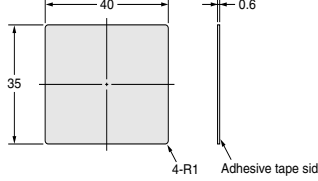
Material: Acrylics



E39-RS2

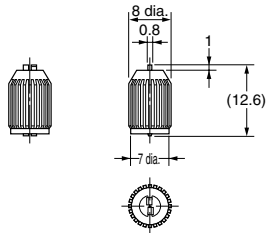


Material: Acrylics



Sensitivity adjustment driver (Unit: mm)

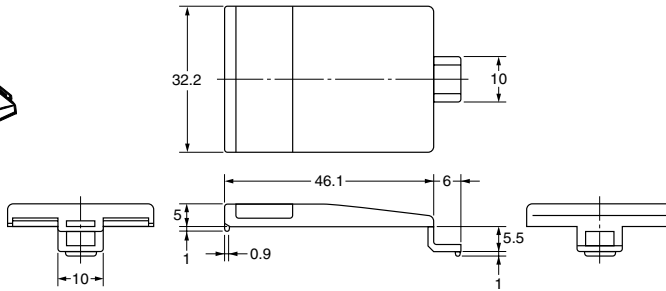
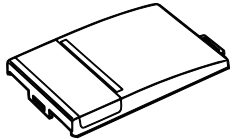
E39-G2



Material: Polycarbonate

Protective Cover(Unit: mm)

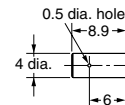
E39-G9



Material: Polycarbonate

Lens Unit(Unit: mm)

E39-F1V



M2.6 x 0.45
Effective depth: 0.9
Countersunk with
straight edge, depth: 0.9