OMRON

Fiber Optic Amplifier

E3X-NV/NVG

A Water-resistant Amplifier with a Green Light Source Ideal for Label and Packaging Industries

- The E3X-NVG uses a green light source to detect colors that cannot be detected using sensors with red light sources
- The E3X-NV incorporates a red light source
- Incorporates teach function with a No-Object Teaching Capability
- Rated IP66: can withstand light washdown
- Remote teach function allows easy remote teaching from the controller

ISO 9001 Approved
OMRON Corporation, Ayabe Factory, Sensing Components and Systems

Ordering Information

■ AMPLIFIER

Item	Red light source	Green light source
Part number	**E3X-NV21**	**E3X-NVG21**
Light source	Red LED (680 nm)	Green LED (565 nm)
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p) 10% max.	
Current consumption	50 mA max.	
Response time	500 μs max. at rated detection distance	
Control output	NPN open collector, load current: 100 mA, residual voltage: 1 V max.	
Timer function (see note)	OFF-delay timer (fixed to 40 ms)	
Teaching confirmation function	Indicator (red/green LEDs) and buzzer	
Remote teaching input	Pink and blue wires are short-circuited when remote input is ON. Pink and blue wires are not short-circuited when remote input is OFF.	
Output	Light-ON and Dark-ON switch selectable	

Note: It is possible to disable the OFF-delay timer function by using the switch setting.

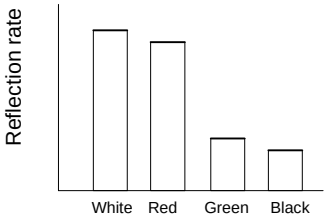
■ LIGHT SOURCE COLOR SELECTION

To distinguish two colors, select a light source color that creates a large difference in the reflection rate between the two colors.

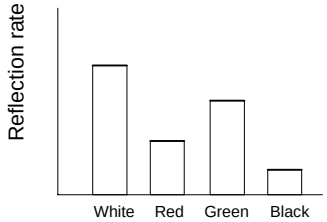
Reflection Rates

Refer to the following table to select the best light source color to distinguish colors.

Red Light Source (E3X-NV)



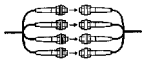
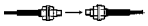
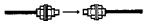
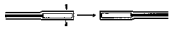
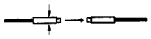
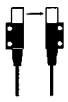
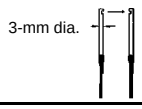
Green Light Source (E3X-NVG)

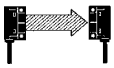
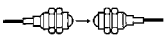
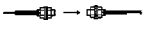
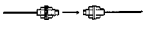
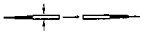
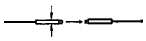
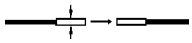
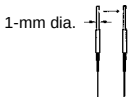
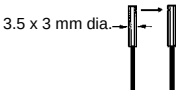
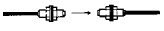
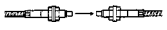
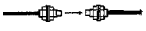
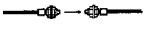
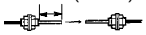
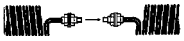
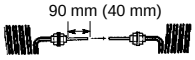
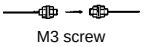
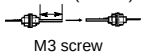


Colors to be distinguished	Light source	
	Red	Green
White – Red		Yes
White – Green	Yes	
Red – Green	Yes	
Black – Red	Yes	
Black – Green		Yes
White – Black	Yes	Yes

■ FIBER UNIT

Through-beam (Separate) Sensors

Part Number	Appearance	Detection distance (standard object)* (NV: E3X-NV21; NVG: E3X-NVG21)	Min. detectable object (opaque objects)	Features
E32-M21	 M3 screw ***	NV: 210 mm (2-mm dia. min.) NVG: 20 mm (2-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.3-mm dia.	4-head; 4-point detection
E32-T11	 M4 screw	NV: 260 mm (1,400 mm**) (1-mm dia. min.) NVG: 10 mm (120 mm**) (1-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	Flexible (resists breaking)
E32-T11L	 M4 screw	NV: 540 mm (1,280 mm**) (1.4-mm dia. min.) NVG: 40 mm (120 mm**) (1.4-mm dia. min.)	NV: 0.15-mm dia. NVG: 0.5-mm dia.	Long distance
E32-T12F	 5-mm dia.	NV: 1,070 mm (4-mm dia. min.) NVG: 70 mm (4-mm dia. min.)	NV: 0.3-mm dia. NVG: 0.6-mm dia.	Teflon-covered****; withstands chemicals and harsh environments
E32-T12L	 3-mm dia.	NV: 540 mm (1.4-mm dia. min.) NVG: 40 mm (1.4-mm dia. min.)	NV: 0.15-mm dia. NVG: 0.5-mm dia.	Long distance
E32-T14		NV: 1,070 mm (4-mm dia. min.) NVG: 80 mm (4-mm dia. min.)	NV: 0.2-mm dia. NVG: 0.2-mm dia.	Side-view
E32-T14L	 3-mm dia.	NV: 140 mm (1-mm dia. min.) NVG: 10 mm (1-mm dia. min.)	NV: 0.2-mm dia. NVG: 0.1-mm dia.	Side-view; long distance

Part Number	Appearance	Detection distance (standard object)* (NV: E3X-NV21; NVG: E3X-NVG21)	Min. detectable object (opaque objects)	Features
E32-T16		NV: 1,070 mm (visual field: 2 x 10 mm)***** (10-mm dia. min.) NVG: 150 mm (visual field: 2 x 10 mm) (10-mm dia. min.)	NV: 5-mm dia. (0.15-mm dia.)****** NVG: 7-mm dia. (1.0-mm dia.)******	Screened; detects over a 10-mm area
E32-T17L	 M4 screw	NV: 7,500 mm (10-mm dia. min.) NVG: 800 mm (10-mm dia. min.)	NV: 0.5-mm dia. NVG: 2.1-mm dia.	Long distance
E32-T21	 M3 screw	NV: 70 mm (0.5-mm dia. min.) NVG: 6 mm (0.5-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.1-mm dia.	Flexible (resists breaking)
E32-T21L	 M3 screw	NV: 160 mm (0.9-mm dia. min.) NVG: 10 mm (0.9-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	Long distance with thin fiber
E32-T22	 2-mm dia.	NV: 75 mm (0.5-mm dia. min.) NVG: 7 mm (0.5-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.1-mm dia.	General-purpose
E32-T22L	 2-mm dia.	NV: 160 mm (0.9-mm dia. min.) NVG: 10 mm (0.9-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	Long distance with thin fiber
E32-T22S	 3 mm dia.	NV: 650 mm (1.7-mm dia. min.)	NV: 0.2-mm dia.	General-purpose; detects wafers and small difference in height
E32-T24	 1-mm dia.	NV: 48 mm (0.5-mm dia. min.) NVG: 2 mm (0.5-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	Side-view; space saving
E32-T24S	 3.5 x 3 mm dia.	NV: 480 mm (1.7-mm dia. min.)	NV: 0.1-mm dia.	Side-view; detects wafers and small difference in height
E32-T51	 M4 screw	NV: 320 mm (1.5-mm dia. min.) NVG: 20 mm (1.5-mm dia. min.)	NV: 0.3-mm dia. NVG: 1.0-mm dia.	Heat-resistant; resists 150°C
E32-T61	 M4 screw ***	NV: 190 mm (2,100 mm**) (1-mm dia. min.) NVG: 18 mm (130 mm**) (1-mm dia. min.)	NV: 0.15-mm dia. NVG: 0.5-mm dia.	Heat-resistant; resists 300°C
E32-TC200	 M4 screw	NV: 290 mm (2,100 mm**) (1-mm dia. min.) NVG: 28 mm (190 mm**) (1-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	General-purpose
E32-TC200A	 M3 screw	NV: 270 mm (1-mm dia. min.) NVG: 28 mm (1-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	General-purpose
E32-TC200B **E32-TC200B4**	90 mm (40 mm)  M4 screw ( ): E32-TC200B4	NV: 290 mm (1-mm dia. min.) NVG: 28 mm (1-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	General-purpose
E32-TC200C	 M4 screw ***	NV: 210 mm (850 mm**) (1-mm dia. min.) NVG: 18 mm (100 mm**) (1-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	Flexible spiral cord
E32-TC200D **E32-TC200D4**	90 mm (40 mm)  M4 screw *** ( ): E32-TC200D4	NV: 210 mm (1-mm dia. min.) NVG: 18 mm (1-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.2-mm dia.	Flexible spiral cord
E32-TC200E	 M3 screw	NV: 75 mm (0.5-mm dia. min.) NVG: 8 mm (0.5-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.1-mm dia.	General-purpose
E32-TC200F **E32-TC200F4**	90 mm (40 mm)  M3 screw ( ): E32-TC200F4	NV: 75 mm (0.5-mm dia. min.) NVG: 8 mm (0.5-mm dia. min.)	NV: 0.1-mm dia. NVG: 0.1-mm dia.	General-purpose

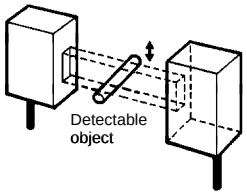
*Standard object: opaque; **With the E39-F1.; ***Cannot be trimmed;

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

*****Detection distances for slit applications are in the following table.

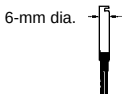
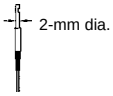
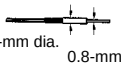
******The minimum size of the detectable object varies with the detection method.
Values not in parentheses are possible within a 10-mm detection distance.

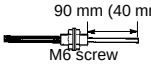
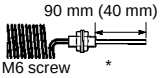
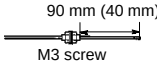
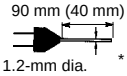
■ E32-T16 WITH SLIT KIT

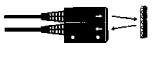
Slit width		0.5-mm	1.0-mm	Detection method
With **E3X-NV21**	Detection distance	480 mm	850 mm	
	Min. detectable object	5.0-mm dia. (0.1-mm dia.)*	5.0-mm dia. (0.1-mm dia.)*	
With **E3X-NVG21**	Detection distance	20 mm	60 mm	
	Min. detectable object	7.0-mm dia. (0.25-mm dia.)*	7.0-mm dia. (0.35-mm dia.)*	

* Values without parentheses are possible within a 10-mm detection area.
Values in parentheses are possible at the center of a 10-mm detection area.

■ REFLECTIVE SENSORS

Part Number	Appearance	Detection distance (standard object) (NV: E3X-NV21; NVG: E3X-NVG21)		Min. detectable object (copper wire)	Features
		White paper	Black paper		
E32-D11		NV: 65 mm (10 x 10 cm) NVG: 7 mm (2.5 x 2.5 cm)	NV: 14 mm (10 x 10 cm) NVG: ---	NV: 0.012-mm dia. NVG: 0.5-mm dia.	Flexible (resists breaking)
E32-D11L		NV: 160 mm (20 x 20 cm) NVG: 10 mm (2.5 x 2.5 cm)	NV: 44 mm (20 x 20 cm) NVG: ---	NV: 0.012-mm dia. NVG: 3.0-mm dia.	Long distance
E32-D12		NV: 85 mm (10 x 10 cm) NVG: 2 mm (2.5 x 2.5 cm)	NV: 22 mm (10 x 10 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.6-mm dia.	Long distance
E32-D12F		NV: 55 mm (5 x 5 cm) NVG: 4 mm (2.5 x 2.5 cm)	NV: 16 mm (5 x 5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 0.5-mm dia.	Teflon-covered***; withstands chemicals and harsh environments
E32-D14L		NV: 44 mm (5 x 5 cm) NVG: 1.5 mm (2.5 x 2.5 cm)	NV: 8.8 mm (5 x 5 cm) NVG: ---	NV: 0.015-mm dia. NVG: 1.0-mm dia.	Side-view; long distance
E32-D21		NV: 9 mm (2.5 x 2.5 cm) NVG: 1 mm (2.5 x 2.5 cm)	NV: 1.7 mm (2.5 x 2.5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Flexible (resists breaking)
E32-D21L		NV: 38 mm (5 x 5 cm) NVG: 1 mm (2.5 x 2.5 cm)	NV: 10 mm (5 x 5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Long distance
E32-D22L		NV: 38 mm (5 x 5 cm) NVG: 1 mm (2.5 x 2.5 cm)	NV: 10 mm (5 x 5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Long distance
E32-D24		NV: 17 mm (2.5 x 2.5 cm) NVG: 1.6 mm (2.5 x 2.5 cm)	NV: 2.8 mm (2.5 x 2.5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Side-view; space saving
E32-D32		NV: 33 mm (2.5 x 2.5 cm) NVG: 2.5 mm (2.5 x 2.5 cm)	NV: 5.8 mm (2.5 x 2.5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 0.5-mm dia.	General-purpose
E32-D32L		NV: 65 mm (10 x 10 cm) NVG: 4 mm (2.5 x 2.5 cm)	NV: 11 mm (10 x 10 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1-mm dia.	General-purpose
E32-D33		NV: 7 mm (2.5 x 2.5 cm) NVG: ---	NV: 1.4 mm (2.5 x 2.5 cm) NVG: ---	NV: 0.012-mm dia. NVG: ---	Super-thin; minute object detection
E32-D51		NV: 65 mm (10 x 10 cm) NVG: 5 mm (2.5 x 2.5 cm)	NV: 13 mm (10 x 10 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Heat-resistive; resists 150°C

Part Number	Appearance	Detection distance (standard object) (NV: E3X-NV21; NVG: E3X-NVG21)		Min. detectable object (copper wire)	Features
		White paper	Black paper		
E32-D61	 M6 screw *	NV: 50 mm (5 x 5 cm) NVG: 5 mm (2.5 x 2.5 cm)	NV: 10 mm (5 x 5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Heat resistive; resists 300°C
E32-D73	 M4 screw 1.25-mm dia. *	NV: 33 mm (5 x 5 cm) NVG: 3 mm (2.5 x 2.5 cm)	NV: 6.6 mm (5 x 5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Heat resistive; resists 400°C
E32-CC200	 M6 screw	NV: 110 mm (10 x 10 cm) NVG: 10 mm (2.5 x 2.5 cm)	NV: 22 mm (10 x 10 cm) NVG: 2 mm (2.5 x 2.5 cm)	NV: 0.012-mm dia. NVG: 0.5-mm dia.	Coaxial; positioning accuracy
E32-DC200	 M6 screw	NV: 110 mm (10 x 10 cm) NVG: 10 mm (2.5 x 2.5 cm)	NV: 22 mm (10 x 10 cm) NVG: ---	NV: 0.012-mm dia. NVG: 0.2-mm dia.	General-purpose
E32-DC200B **E32-DC200B4**	 90 mm (40 mm) M6 screw ( ): E32-DC200B4	NV: 110 mm (10 x 10 cm) NVG: 10 mm (2.5 x 2.5 cm)	NV: 22 mm (10 x 10 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	General-purpose
E32-DC200C	 M6 screw *	NV: 33 mm (5 x 5 cm) NVG: 2.5 mm (2.5 x 2.5 cm)	NV: 6.5 mm (5 x 5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Flexible spiral cord
E32-DC200D **E32-DC200D4**	 90 mm (40 mm) M6 screw * ( ): E32-DC200D4	NV: 33 mm (5 x 5 cm) NVG: 2.5 mm (2.5 x 2.5 cm)	NV: 6.5 mm (5 x 5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Flexible spiral cord
E32-DC200E	M3 screw	NV: 22 mm (2.5 x 2.5 cm) NVG: 2 mm (2.5 x 2.5 cm)	NV: 5 mm (2.5 x 2.5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	General-purpose
E32-DC200F **E32-DC200F4**	 90 mm (40 mm) M3 screw ( ): E32-DC200F4	NV: 22 mm (2.5 x 2.5 cm) NVG: 2 mm (2.5 x 2.5 cm)	NV: 5 mm (2.5 x 2.5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	General-purpose
E32-DC9G **E32-DC9G4**	 90 mm (40 mm) 1.2-mm dia. * ( ): E32-DC9G4	NV: 38 mm (5 x 5 cm) NVG: 2.5 mm (2.5 x 2.5 cm)	NV: 7.5 mm (5 x 5 cm) NVG: ---	NV: 0.012-mm dia. NVG: 1.0-mm dia.	Stainless steel sleeve
E32-L24L		NV: 4±2 mm (2.5 x 2.5 cm)	---	NV: 0.012-mm dia.	Limited reflective, long distance, side-view; detects wafers and small difference in height
E32-L25		NV: 3.3 mm (2.5 x 2.5 cm)	---	NV: 0.012-mm dia.	Limited reflective; detects wafers and small difference in height
E32-L25A		NV: 3.3 mm (2.5 x 2.5 cm)	---	NV: 0.012-mm dia.	Limited reflective; detects wafers and small difference in height
E32-L25L		NV: 7.2±1.8 mm (2.5 x 2.5 cm)	---	NV: 0.012-mm dia.	Limited reflective, long distance; detects wafers and small difference in height

Part Number	Appearance	Detection distance (standard object) (NV: E3X-NV21; NVG: E3X-NVG21)		Min. detectable object (copper wire)	Features
		White paper	Black paper		
E32-R16 +E39-R1	 Reflector E39-R1	NV: 150 to 1,500 mm (35-mm dia. min.)**	---	NV: 0.5-mm dia.	Transparent objects detection
E32-R21 +E39-R3	 M6 screw Reflector E39-R1	NV: 25 to 250 mm (35-mm dia. min.)**	---	NV: 0.3-mm dia.	Transparent objects detection

*Cannot be trimmed; **Standard object: opaque

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

Note: Reflective sensors: The photoelectric sensor may turn ON if the sensitivity is set to maximum, in which case, reduce the sensitivity.

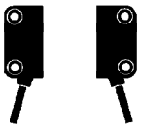
■ SLOTTED FIBER UNIT

Part Number	Appearance	Detection distance (standard object)* (NV: E3X-NV21; NV: E3X-NVG21)	Min. detectable object (opaque objects)	Features
E32-G14		10 mm (slot width)** (4-mm dia. min.)	NV: 0.4-mm dia. NVG: 0.6-mm dia.	Slot through-beam; no optical axis adjustment required

*Standard object: opaque

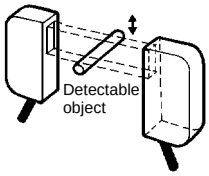
** No-object teaching is not possible with the E32-G14 because the detection distance of the E32-G14 is short and the light will be excessive. Perform with/without-object teaching instead.

■ HIGH-PRECISION SENSING FIBER UNIT

PartNumber	Appearance	Slit width	Detection distance (NV: E3X-NV21)	Min. detectable object* (horizontal beam)
E32-T16P		Not used	NV: 480 mm	NV: 1.3-mm dia. (0.6-mm dia.)
		0.5 mm wide	NV: 80 mm	NV: 1.3-mm dia. (0.4-mm dia.)
		1.0 mm wide	NV: 160 mm	NV: 1.3-mm dia. (0.5-mm dia.)

* Values not in parentheses represent detectable objects within the 11-mm detection area, and values in parentheses represent detectable objects in the center of the E32-T16P detection area. The diameters of detectable objects in the above table represent detectable object sizes for objects not moving.

Detection Direction



■ MOUNTING BRACKET FOR E32-T16P (OPTION)

Sold in pairs.

Part Number	Applicable Fibers
E39-L94	E32-T16P

Specifications

■ RATINGS/CHARACTERISTICS

Amplifier

Item		E3X-NV21	E3X-NVG21
Indicator	Orange LED	Lit during output operation	
	Green LED	Lit with stable light reception or no light	
Circuit protection		Reverse polarity, Output short-circuit	
Ambient illumination	Sunlight	10,000 /x max.	
	Incandescent lamp	3,000 /x max.	
Ambient temperature	Operating	−25°C to 55°C (−13°F to 131°F) with no icing	
	Storage	−40°C to 70°C (−40°F to 158°F) with no icing	
Ambient humidity	Operating	35% to 85% (with no condensation)	
Insulation resistance		20 MW 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 or 300 m/s^2 (approx. 30G) for 2 hrs each in X, Y, and Z directions	
Shock resistance		500 m/s^2 (approx. 50G) for 3 times each in X, Y, and Z directions	
Enclosure rating		IEC IP66 (with protective cover in place) (see note)	
Material	Case	Heat-resistant ABS	
	Cover	Polycarbonate	
Weight (with 2-m cord)		Approx. 100 g	

Note: The enclosure rating of the amplifier is IP65 when the amplifier is connected to a fine fiber sensor, a heat-resistant sensor (such as the E32-T61, E32-D61, or E32-D73), a sleeve fiber sensor, or the E32-M21. The enclosure rating of the amplifier with no protective cover is IP50.

■ FIBER CABLES

Common

Ambient storage temperature	Heat-resistant fiber	−40°C to 110°C (−40°F to 230°F) with no icing
	Other fibers	−40°C to 70°C (−40°F to 158°F) with no icing
Ambient storage humidity	Operating	35% to 95% (with no condensation)
Vibration resistance		10 to 55 Hz, 1.5-mm double amplitude for 2 hrs each in X, Y, and Z directions
Shock resistance		500 m/s^2 (approx. 50G) for 3 times each in X, Y, and Z directions

Through-beam (Separate) Fibers

Part Number	Ambient Temperature Operating	Ambient Humidity Operating	Permissible Bending Radius	Material	Enclosure Rating
E32-M21	−40°C to 70°C (−40°F to 158°F) with no icing	35% to 85%	25 mm min.	Black polyethylene	IEC IP67
E32-T11			4 mm min.	Vinyl chloride	
E32-T11L			25 mm min.	Black polyethylene	
E32-T12F	−30°C to 70°C (−22°F to 158°F) with no icing		40 mm min.	Teflon-covered* black polyethylene	
E32-T12L	−40°C to 70°C (−40°F to 158°F) with no icing		25 mm min.	Black polyethylene	
E32-T14					
E32-T14L					
E32-T16					
E32-T17L					
E32-T21			4 mm min.	Vinyl chloride	
E32-T21L			25 mm min.	Black polyethylene	
E32-T22					
E32-T22L					
E32-T24					
Part Number	Ambient Temperature Operating	Ambient Humidity Operating	Permissible Bending Radius	Material	Enclosure Rating

E32-T51	−40°C to 150°C** (−40°F to 302°F) with no icing		35 mm min.	Fluoride resin	
E32-T61	−40°C to 300°C (−40°F to 572°F) with no icing		25 mm min.	SUS	
E32-TC200	−40°C to 70°C (−40°F to 158°F) with no icing			Black polyethylene	
E32-TC200A					
E32-TC200B E32-TC200B4					
E32-TC200C					
E32-TC200D E32-TC200D4					
E32-TC200E					
E32-TC200F E32-TC200F4					

*Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.
**When used continuously between −40°C and 130°C (−40°F and 266°F).

Diffuse Fibers

Part Number	Differential Travel	Ambient Temperature Operating	Ambient Humidity Operating	Permissible Bending Radius	Material	Enclosure Rating
E32-D11	20% of max. of detection distance	−40°C to 70°C (−40°F to 158°F) with no icing	35% to 85%	4 mm min.	Vinyl chloride	IEC IP67
E32-D11L				25 mm min.	Black polyethylene	
E32-D12						
E32-D12F		−30°C to 70°C (−22°F to 158°F) with no icing		40 mm min.	Teflon-covered black polyethylene*	
E32-D14L		−40°C to 70°C (−40°F to 158°F) with no icing		25 mm min.	Black polyethylene	
E32-D21				4 mm min.	Vinyl chloride	
E32-D21L				25 mm min.	Black polyethylene	
E32-D22L						
E32-D24						
E32-D32						
E32-D32L						
E32-D33						
E32-D51		−40°C to 150°C (−40°F to 302°F) with no icing **		35 mm min.	Fluoride resin	
E32-D61		−40°C to 300 °C (−40°F to 572°F) with no icing		25 mm min.	SUS	
E32-D73		−40°C to 400°C (−40°F to752°F) with no icing				
E32-CC200		−40°C to 70°C (−40°F to 158°F) with no icing			Black polyethylene	
E32-DC200						
E32-DC200B E32-DC200B4						
E32-DC200C						

Part Number	Differential Travel	Ambient Temperature Operating	Ambient Humidity Operating	Permissible Bending Radius	Material	Enclosure Rating
E32-DC200D E32-DC200D4	20% of max. of detection distance	−40°C to 70°C (−40°F to 158°F) with no icing	35% to 85%	25 mm min.	Black polyethylene	EC IP67
E32-DC200E						
E32-DC200F E32-DC200F4						
E32-DC9G E32-DC9G4						
E32-L24L***	5% of max. of detection distance	−40°C to 105°C (−40°F to 221°F) with no icing		10 mm min. (average at 10% decrease of detection distance)	Reinforced polyethylene	IEC IP50
E32-L25***		−40°C to 70°C (−40°F to 158°F) with no icing		25 mm min.	Black polyethylene	
E32-L25A***						
E32-L25L***		−40°C to 105°C (−40°F to 221°F) with no icing		10 mm min. (average at 10% decrease of detection distance)	Reinforced polyethylene	
E32-R16 with E39-R1	20% of max. of detection distance	−25°C to 55°C (−13°F to 131°F) with no icing		25 mm min.	Black polyethylene	IEC IP66
E32-R21 with E39-R3		−40°C to 70°C (−40°F to 158°F) with no icing				IEC IP67

*Teflon is a registered trademark of the Dupont Company and the Mitsui Dupont Chemical Company for their fluoride resin.
**When used continuously between −40°C and 130°C (−40°F and 266°F).
***Beam size: 2 mm dia.

Fine Through-beam Fibers

Part Number	Beam Size	Ambient Temperature Operating	Ambient Humidity Operating	Permissible Bending Radius*	Material	Enclosure Rating
E32-T22S	13 mm dia. (at a distance of 200 mm)	−40°C to 70°C (−40°F to 158°F) with no icing	35% to 85%	10 mm min.	Reinforced laminated vinyl chloride	IEC IP67
E32-T24S						

*Average at 70% decrease of detection distance

Slot Fibers

Part Number	Ambient Temperature Operating	Ambient Humidity Operating	Permissible Bending Radius	Material	Enclosure Rating
E32-G14	−40°C to 70°C (−40°F to 158°F) with no icing	35% to 85%	25 mm min.	Fiber sheath: Black polyethylene	IEC IP67

High-precision Screen Fiber Unit

Part Number	AmbientTemperature Operating	Ambient Humidity Operating	Permissible Bending Radius*	Material	Enclosure Rating
E32-T16P **	−40°C to 70°C (−40°F to 158°F) with no icing	35% to 85%	10 mm min.	Sensing head: Heat-resistant ABS Fiber sheath: Vinyl chloride	IEC IP50

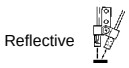
*Average at 10% decrease of detection distance
**Attachments: two slits each (0.5 mm and 1.0 mm wide)

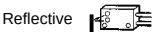
■ ACCESSORIES

Item		Small Spot Lens Unit	Long Distance Lens Unit			
Applications		Detection over 0.5-mm-dia. spots	Increasing detection distance			
Part number		E39-F3A	E39-F1			
Appearance		Reflective 	Through-beam (separate) 			
Applicable fibers		E32-D32	E32-T11L	E32-TC200 E32-T61	E32-T11	E32-TC200C
With E3X-NV21	Detection distance	22 mm*	1,280 mm	2,100 mm	1,400 mm	850 mm
	Standard object	White paper 2.5 x 2.5 cm	Opaque objects: 4-mm dia. min.			
With E3X-NVG21	Detection distance	---	120 mm	190 mm**	120 mm	100 mm
	Standard object	---	Opaque objects: 4-mm dia. min.			
Directivity		---	5° to 40°			
Differential travel		20% of detection distance	---			
Ambient temperature	Operating	−40°C to 70°C (−40°F to 158°F)	E32-T61: −40°C to 200°C (−40°F to 392°F) Do not exceed the operating temperature of the fiber.			
Material	Shaft	Aluminum	Brass			
	Lens	Optical glass				
	Base	---				
	Reflector	---				

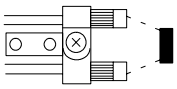
*When inserting 15 mm.
**E32-T61: 130 mm

Item		Side-view Unit			
Applications		Changing the detection direction at °90			
Part number		E39-F2			
Appearance		Through-beam (separate) 			
Applicable fibers		E32-T11L	E32-TC200	E32-T61 E32-T11	E32-TC200C
With E3X-NV21	Detection distance	265 mm	265 mm	210 mm	105 mm
	Standard object	Opaque objects: 3-mm dia. min.			
With E3X-NVG21	Detection distance	10 mm	19 mm	10 mm	6 mm
	Standard object	Opaque objects: 4-mm dia. min.	Opaque objects: 3-mm dia. min.		
Directivity		20° to 60°			
Differential travel		---			
Ambient temperature	E32-T61	−40°C to 200°C (−40°F to 392°F) Do not exceed the operating temperature of the fiber.			
Material	Shaft	Brass			
	Lens	Optical glass			
	Base	---			
	Reflector	---			

Item			Lens-equipped Reflective Unit		
Applications			Converting through-beam sensors to reflective sensors		
Part number			E39-F3		
Appearance					
Applicable fibers			E32-T11L	E32-TC200	E32-T61
With E3X-NV21	Detection distance (standard object)	White paper	55 to 160 mm*	85 to 110 mm*	
		Black paper	---	16 to 18 mm*	17 to 19 mm*
With E3X-NVG21	Detection distance (standard object)	White paper	---	10 to 15 mm* (2.5 x 2.5 cm)	---
		Black paper	---		
Differential travel			20% of detection distance		
Ambient temperature	E32-T61		−40°C to 200°C (−40°F to 392°F) Do not exceed the operating temperature of the fiber.		
Material	Shaft		Brass		
	Lens		Optical glass		
	Base		Aluminum		
	Reflector		---		

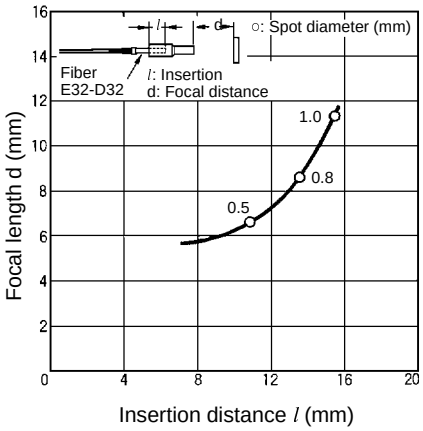
Item			Lens-equipped Reflective Unit		Side-view Reflective Unit
Applications			Converting through-beam sensors to reflective sensors		Converting through-beam to reflective sensor
Part number			E39-F3		E39-F5
Appearance					
Applicable fibers			E32-T11	E32-TC200C	E32-TC200A
With E3X-NV21	Detection distance (standard object)	White paper	90 to 110 mm*	85 to 110 mm*	5 to 32 mm*
		Black paper	---		6 to 10 mm*
With E3X-NVG21	Detection distance (standard object)	White paper	---		
		Black paper	---		
Directivity			---		
Differential travel			20% of detection distance		
Ambient temperature			E32-T61: −40°C to 200°C (−40°F to 392°F) Do not exceed the operating temperature of the fiber.		Operating: −40°C to 70°C (−40°F to 158°F)
Material	Shaft		Brass		---
	Lens		Optical glass		---
	Base		Aluminum		Brass
	Reflector		---		Stainless

*These values are possible when the angle of the E39-F3 is smallest (parallel).

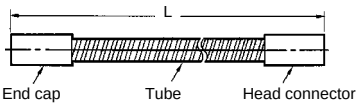


■ BEAM SPOT CHARACTERISTICS

E39-F3A with E32-D32



■ STAINLESS STEEL SHEATHING

Part number		E39-F32A5	E39-F32A	E39-F32B5	E39-F32B	E39-F32C5	E39-F32C	E39-F32D5	E39-F32D
Appearance									
Length (L)		500 mm	1,000 mm	500 mm	1,000 mm	500 mm	1,000 mm	500 mm	1,000 mm
Applicable fiber		E32-DC200E E32-DC200F(4) E32-D21		E32-TC200E E32-TC200F(4) E32-T21 E32-T21L		E32-TC200 E32-TC200B(4) E32-T11 E32-T51 E32-T11L		E32-DC200 E32-DC200B(4) E32-CC200 E32-D11 E32-D51 E32-D11L	
Ambient temperature	Operating	−40°C to 150°C (−40°F to 302°F) Do not exceed the operating temperature of the fiber							
Ambient humidity	Operating	35% to 85%							
Permissible bending radius		30 mm min.							
Tensile strength	Between head connector and end cap with tube	15 kgf • cm max. (1.5 N • m)							
	Tube	20 kgf • cm max. (2 N • m)							
Compression load	Tube	3 kg max. (29.4 N)							

■ ACCESSORIES

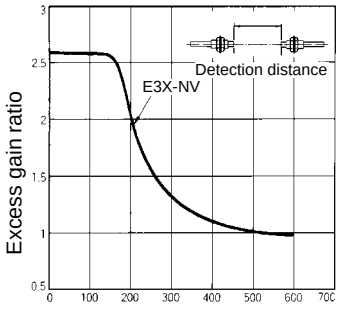
Item	Fiber Cable Cutter	Fine-fiber Attachment	Fiber Cable Connector	Sleeve Bender
Part number	E39-F4	E39-F9	E39-F10	E39-F11
Appearance				
Features	Used to cut fibers to desired lengths	Used when inserting fine fibers into the amp	Used to connect fibers when broken	Used to bend fiber sleeves
Applicable fiber	All models equipped with fibers that can be trimmed.	E32-DC200E, -TC200E E32-DC200F(4), -TC200F(4) E32-D21, -D21L, -D22L E32-T21, -T21L, -T22L E32-D32, -T22 E32-D24, -T24 E32-D33 E32-R21	E32-DC200, -TC200 E32-DC200B(4), -TC200B(4) E32-TC200A E32-T14, -G14 E32-D11L, -T11L, -T12L E32-D14L, -T14L E32-T17L	E32-TC200B(4) E32-TC200D(4) E32-DC200F(4), -TC200F(4) E32-DC9G(4)

Engineering Data

■ EXCESS GAIN RATIO

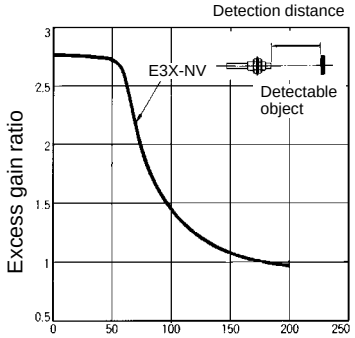
With Standard Object

E32-TC200



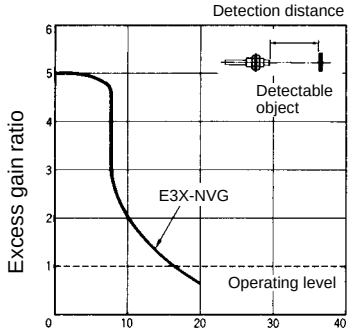
Detection distance (mm)

E32-DC200



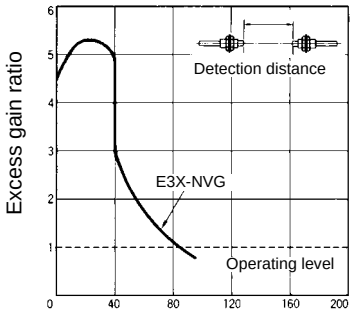
Detection distance (mm)

E32-D11L



Detection distance (m)

E32-T11L, -T12L

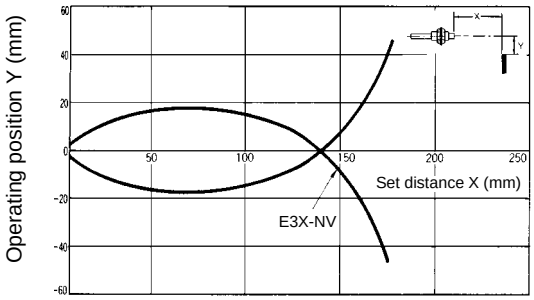


Detection distance (mm)

■ OPERATING RANGE

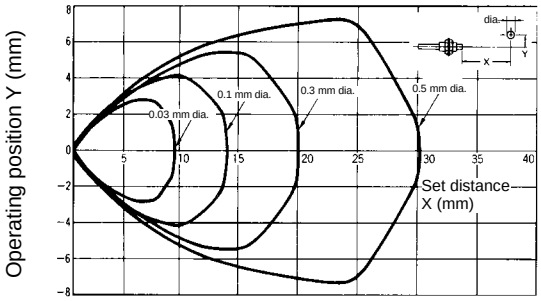
With standard detectable object at max. sensitivity.

E32-DC200



■ DETECTABLE OBJECTS VS. OPERATING RANGE

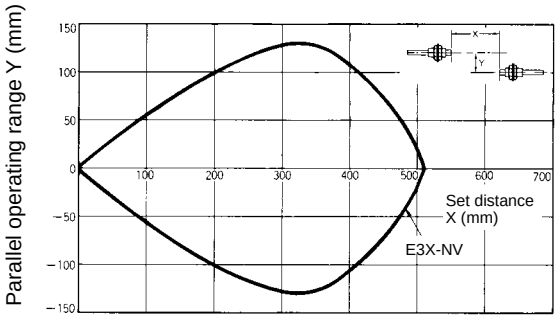
E32-DC200 with E3X-NV21



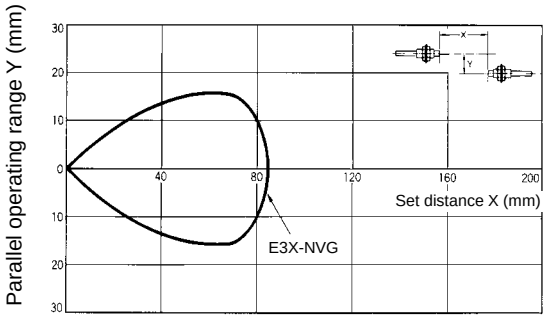
■ PARALLEL OPERATING RANGE

At max. sensitivity.

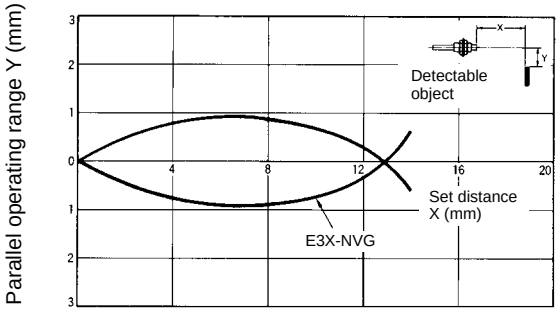
E32-TC200



E32-T11L, -T12L



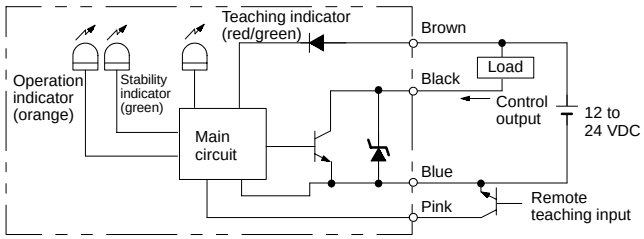
E32-D11L



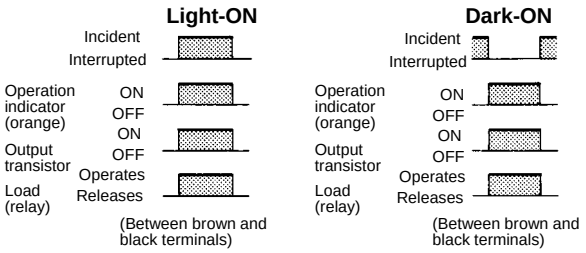
Operation

■ OUTPUT CIRCUITS

E3X-NV21/NVG21



Timing Chart



■ WITH/WITHOUT-OBJECT TEACHING, NO-OBJECT TEACHING, MAXIMUM SENSITIVITY SETTING

Refer to the following table to select the most suitable sensitivity setting method.

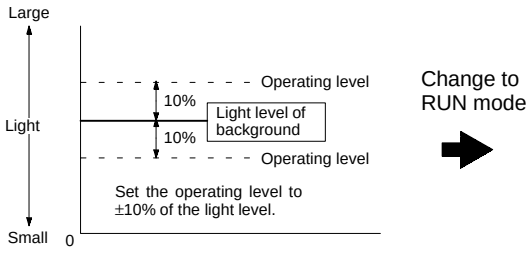
Sensitivity setting method	Maximum sensitivity setting	No-object teaching	With/Without-object teaching
Typical application	Detection of the existence of objects that interrupt light perfectly Detection of objects with no background objects	If teaching is impossible by stopping the movement of detectable objects To detect bright or dark objects by teaching only with background objects	Detection of a slight difference in reflection Color discrimination Background objects with unstable reflection Detection of object surface irregularities
		Elimination of background object influence	

Note: If the set distance is very short (i.e., 0 to 12 mm for the E32-TC200 and 0 to 4 mm for the E32-DC200), no-object teaching is not possible due to excessive light. In this case, perform with/without-object teaching.

■ NO-OBJECT TEACHING WITH AN INITIAL OPERATING LEVEL COMPENSATION FUNCTION

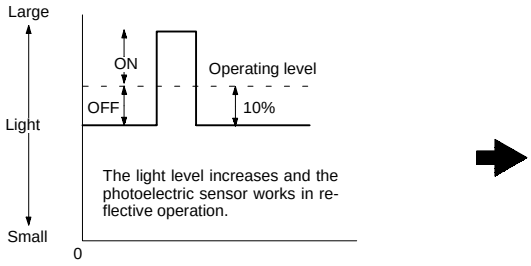
With Diffuse (Light-ON) Fiber

1. Teaching button is pressed once.

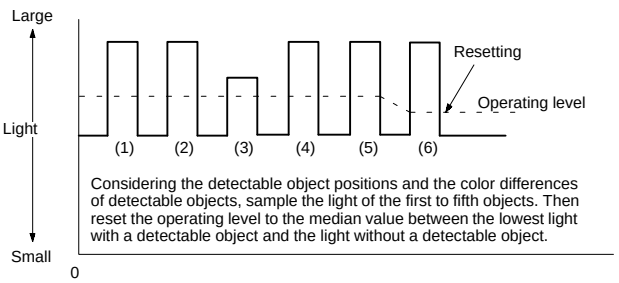


Change to RUN mode

2. The first detectable object is in the detectable area.



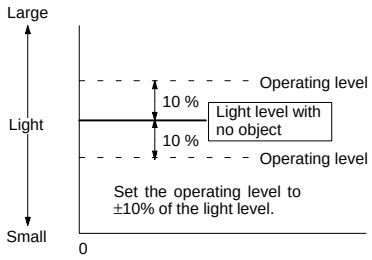
3. Detectable objects continue to pass through the sensing area.



Note: If the light value up to the fifth object is at least twice as large as the operating level, the initial set operating level (10%) will be maintained.

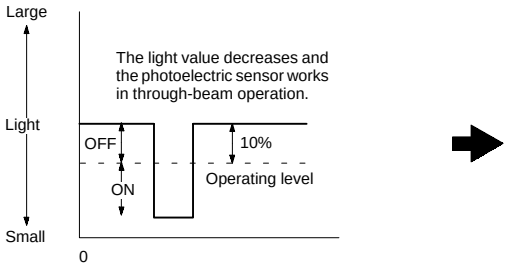
With Through-beam (Dark-ON) Fiber Unit

1. Teaching button is pressed once.

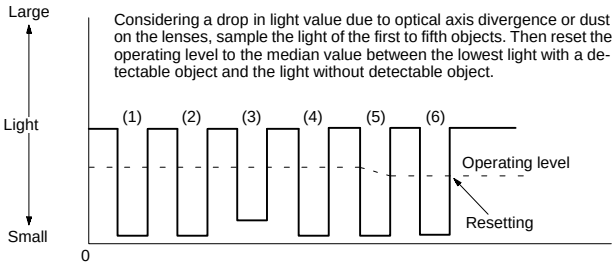


Change to RUN mode

2. The first detectable object is in the sensing area.



3. Detectable objects continue to pass through the sensing area.



Note: 1. After no-object teaching, when the E3X-NV□ is turned off and on, the operation level will be set to the +10% of the initial light level (refer to the above (1)) in reflective operation and −10% of the initial light level in through-beam operation and stand by.

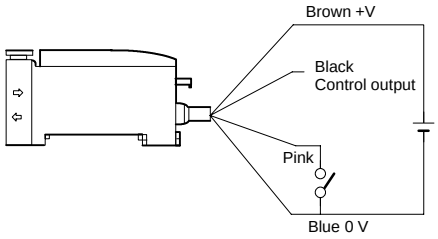
2. After performing no-object teaching and changing to RUN mode, until the first detectable object is in the sensing area, the control output will be prohibited (OFF). The control output will be determined when the first detectable object is detected.
3. The initial operating level compensation function will operate after teaching and/or after the E3X-NV□ is turned on.
4. During no-object teaching, after the E3X-NV□ is in RUN mode, the E3X-NV□ requires approximately 60 ms to determine the operating level from the time the first detectable object is in the sensing area. After the operating level is determined, the E3X-NV□ will operate with a normal response speed of 500 μs.

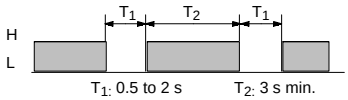
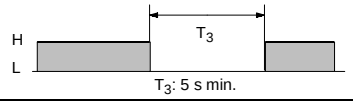
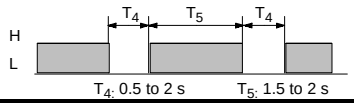
■ REMOTE TEACHING

Remote Teach Function

In principle, the remote teach function of the E3X-NV□ should be used for initial teaching. Basically, the method of remote teaching is the same as that of sensitivity setting. In remote teaching, instead of pressing the teach button, teach is performed with a remote teach input signal.

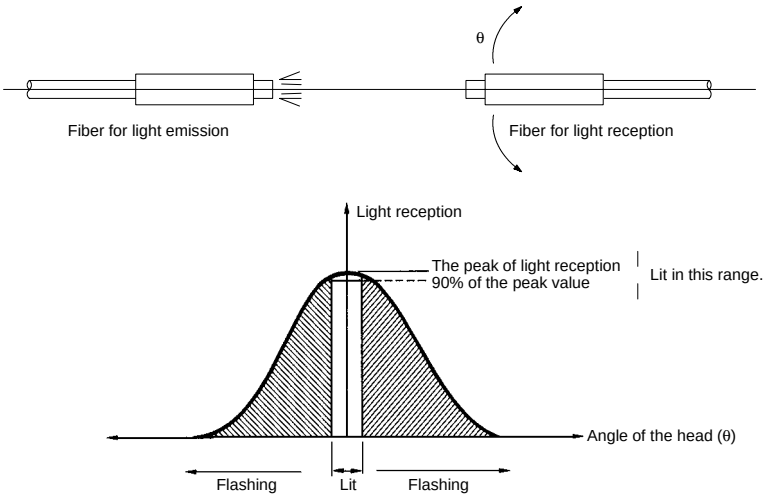
1. Set the mode selector to RUN.
2. The following signal conditions must be given as remote teaching input conditions.
3. If remote teaching is not performed, cut the pink wire at the base or connect the pink wire to the +V terminal.
4. After the remote teaching input setting is finished, the E3X-NV□ will be ready to detect objects in approximately one second.



Power supply		
Remote teach input	With/Without-object teaching	
	Maximum sensitivity setting	
	No-object teaching	

■ OPTICAL AXIS ADJUSTMENT (SUPER-FLASHING FUNCTION)

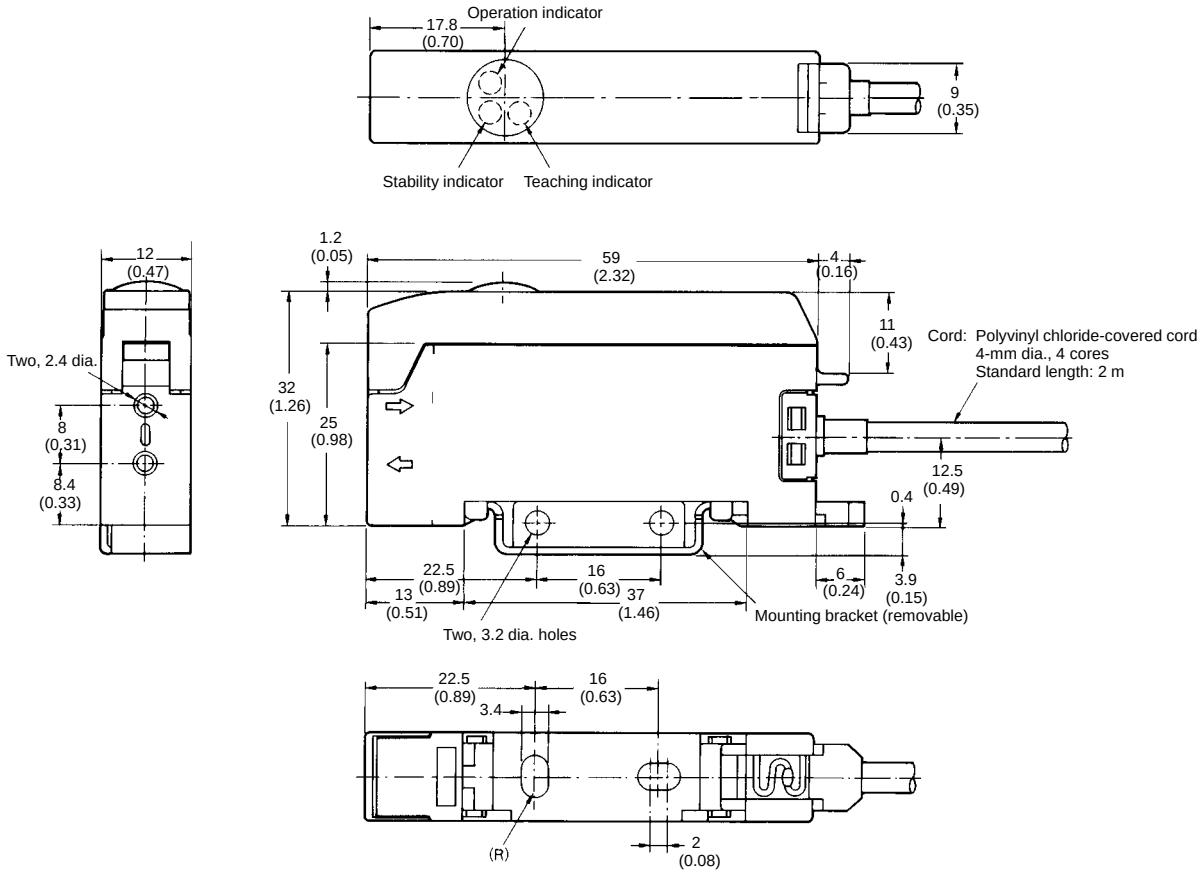
Set the mode selector of the E3X-NV□ to TEACH. The super flashing function of E3X-NV□ will be activated. When the optical axes of the fiber heads are divergent and the light value decreases by approximately 10% of the maximum value, the tip of the emitting fiber will start flashing and the built-in buzzer will beep. At this time, if the optical axes are divergent, adjust the axes. The peak light value will be memorized by the E3X-NV□. Do not press the teach button before or while adjusting the optical axes, or the super-flashing function will not operate.



Dimensions

Unit: mm (inch)

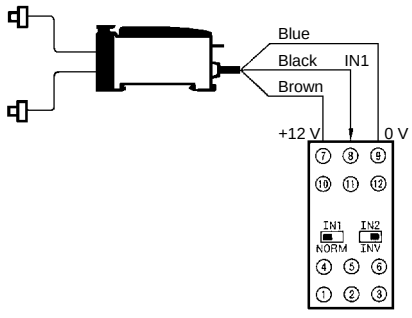
■ **E3X-NV**
E3X-NVG



Installation

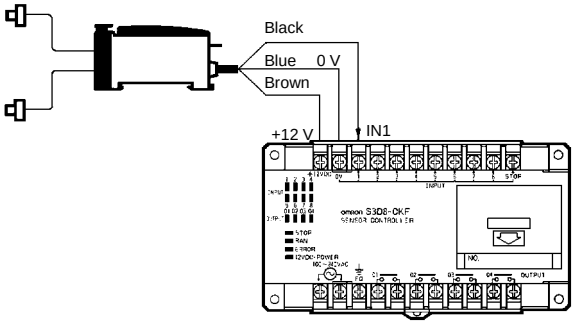
■ **CONNECTION**

Connection with S3D2 Sensor Controller



Note: A maximum of two E3X-NV□ Sensors can be connected.

Connection with S3D8 Sensor Controller



Note: 1. The E3X-NV□ will switch to reverse operation by pressing the L Key.
2. A maximum of eight E3X-NV□ Sensors can be connected.

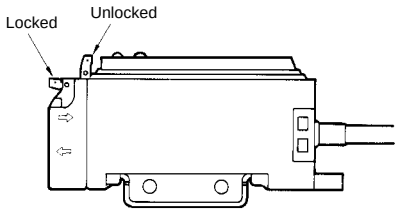
⚠ Caution

■ FIBER UNIT

Fiber Optic Cable Connection and Disconnection

The E3X-NV□ amplifier has a push lock. The fiber must be locked or released in a temperature range of –10° to 40°C. Connect or disconnect the fibers to or from the E3X-NV□ amplifier using the following procedures:

1. Connection



After inserting the fiber optic cable into the Unit, push down the lock lever to secure it.

After cutting the fibers with the Fiber Cutter (E39-F4), place an insertion mark on the fiber so that it can be properly inserted into the Amplifier. Insert the fiber into the Amplifier up to this insertion mark.

2. Disconnection

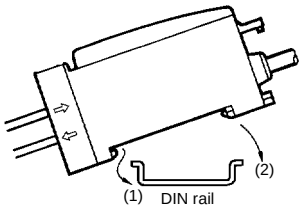
Push up the lock lever so that the fiber optic cable can be removed. To avoid damage, make sure that the fiber is unlocked before removing.

■ AMPLIFIER

Mounting

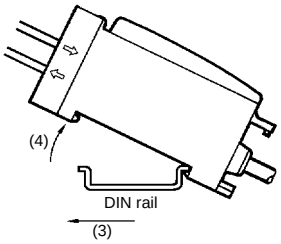
1. Mount the front part on the mounting bracket (sold together) or on a DIN rail.
2. Press the back part onto the mounting bracket or on to the DIN rail.

Note: To assure mounting strength: Do not mount the back part onto the mounting bracket or the DIN rail first before mounting front part on the mounting bracket or the DIN rail.

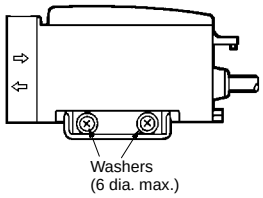


Removal

By pressing the Amplifier in direction (3) and lifting the fiber insertion part in direction (4), as shown here, the amplifier can be removed easily.



For side mounting, attach the mounting bracket on the amplifier first, and secure the amplifier with M3 screws and washers. The diameter of the washers should be 6 mm max.



For removal, pull back the gray rail on the rear bottom with a flat-blade screwdriver so that the amplifier can be removed easily.

Precautions

⚠ WARNING

Avoid Explosion or Fire

- The voltage supplied to the E3X-NV/NVG must be within the rated voltage range. If a voltage exceeding the rated upper limit is imposed on the E3X-NV/NVG.
- Connect each power line of the E3X-NV/NVG correctly.
- Do not short-circuit the load connected to the E3X-NV/NVG.

Turning power on

After the E3X-NV□ is turned on, it will be ready to operate in 100 ms maximum. If power is supplied to the E3X-NV□ and the load is connected to the E3X-NV□ independently, be sure to turn on the power supply connected to the E3X-NV□ first.

When the E3X-NV□ is turned on or off, no control output will be ON, even though the operation indicator of the E3X-NV□ will be lit for an instant.

Mutual Interference Protection function

When closely connecting two to three Fiber Units to more than one E3X-NV□, perform with/without-object teaching on a single E3X-NV□ at a time. Turn on only the E3X-NV□ on which teaching is performed. If all the E3X-NV□ are turned on, interrupt the emitters of the Fiber Units on which teaching is not performed.

Power interruptions or noise caused by static electricity, etc., can result in write errors during any part of the teaching process. These errors include buzzers, lighting of teaching indicators, simultaneous flashing of red/green indicators, lighting of operation indicators, and lighting or flashing of stability indicators. If any of these occur, re-input teaching using the teaching button on the Amplifier.

Unlike experiencing teaching errors, if any memory error occurs, red/green teaching indicators will flash simultaneously, and operation indicators and stability indicators will also flash.

When power is off

The instant power is turned off, the E3X-NV□ could output a pulse signal which could affect the operation of the devices connected to it. This will happen more often if power is supplied to the E3X-NV□ from an external power supply, thus affecting the connected timer and counter. Use a built-in power supply to avoid this.

Cable

To extend the cord, use a wire with 0.3 mm^2 min. The total length of the cable should be 100 m max.

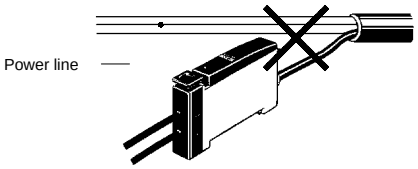
Power supply

If a standard switching regulator is used as a power supply, the frame ground (FG) terminal and the ground (G) terminal must be grounded, or the E3X-NV□ can malfunction, influenced by the switching noise of the power supply.

The supplied voltage must be within the rated voltage range. Unregulated full- or half-wave rectifiers must not be used as power supplies.

Installing/Wiring

Do not wire the amplifier in the same conduit with power lines. Doing so would cause induction between the lines, possibly resulting in faulty operation or destruction. Always provide separate conduit for the wiring to the amplifier.



NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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