OMRON

Color Mark Sensors E3S-DC/E3NX-CA Series



Food/ Beverage/ Personal Care Industries

Packaging Comes in a Variety of Designs and Materials

Recently, packaging materials and designs have grown much more diverse, such as aluminum vapor deposition material to prevent oxidation, or very colorful packages to attract the attention of consumers.



such as aluminum vapor deposition material

in color between the mark and background

Low-reflection packaging, such as film with fine asperities



Business Challenge

If we respond to packaging trends, the number of false detection with color mark sensors will increase, reducing productivity...

More and more people working with color mark detection in the field are calling for the following:

"I want stable detection of aluminum vapor deposition material and other glossy packaging."

"I want stable detection of colorful packaging with little color difference."

"I want stable detection of packaging even if the lot changes."

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NEW Color Mark Photoelectric Sensor E3S-DC

OIO-Link

OMRON's New Color Mark Sensors

Offer Stable Detection of Both Glossy and Colorful Packaging.

It therefore does not reduce the operation rates of production facilities.

The Sensors can accurately detect color marks on glossy and colorful packaging, which have been troublesome for conventional systems. They also help reduce the number of troubleshooting requests made to packaging machine manufacturers—without any decrease in the operation rate due to equipment stoppages caused by false detection.



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"I want stable detection of aluminum vapor deposition material and other glossy packaging."

> The intensity of the light received by the sensor from highly-reflective glossy packaging is too strong, so there is not enough difference in incident levels to perform color mark detection (i.e. saturation, Fig. 1).

The angle needs to be finely adjusted to avoid saturation and allow the sensor to detect the mark. However, if the sensor is tilted too much, detection will become unstable as the incident level decreases (Fig. 2).



E3S-DC/E3NX-CA

Existing challenges

Light Is Received over a Wide Range: Enough Even for Glossy Packaging

This allows for the stable detection of glossy aluminum vapor deposition packaging—simply install the Sensor directly above

Follow along to see how the technology works.

No Saturation Even with 99% Reflective Optical Mirrors

High Dynamic Range (Wide Incident Light Range)

Color Mark Photoelectric Sensor (E3S-DC):

The incident light range in which no saturation occurs—no adjustment required

The included high luminance RGB three-color LED light emitting element drastically improves the light intensity. Meanwhile, Smart Noise Reduction technology in the Fiber Sensor is applied to reduce the amount of noise, resulting in a high dynamic range where the Sensor is not saturated even when detecting a mirror surface—without having to make any light intensity adjustments.

Color Fiber Amplifier Unit (E3NX-CA):

The optimal light intensity—with just two button presses

The high luminance white LED and Smart Noise Reduction technology work together to increase the light intensity and reduce the amount of noise. These have made it possible to expand the light intensity adjustment range for the emitter and receiver to 1/100x and 1/3x respectively, resulting in a high dynamic range four times that of conventional products. You can automatically adjust the optimal intensity by just pressing a button once with a mark and once without it.



* Optical mirror and aluminum vapor deposition material measured at the distance with maximum incident level (13 mm); grayscale measured at the distance with minimum incident level (7 mm or 13 mm).



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"I want stable detection of colorful packaging with little color difference."

With designs becoming more colorful, there are times where there is little difference in color between the color mark and the design elements (background). When color differences are subtle, the S/N ratio*1 required for detection cannot be obtained, and the color mark cannot be detected (Fig. 1).

*1 The ratio of incident levels at which a workpiece is and is not detected. For example, if this is 1,000 when detecting the workpiece and 100 when not detecting the workpiece, the S/N ratio is 10:1. The higher the S/N ratio is, the more stable the detection becomes.



E3S-DC/E3NX-CA

Existing challenges

Provides a High S/N Ratio to Detect Subtle Color Differences

Stable detection even of similar colors with only minor differences

Follow along to see how the technology works.

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High Power to Achieve

Stable Detection

High-Luminance

Device

High-speed, High-precision

Signal Processing

High-speed, High-precision IC

N-Core

Identifies Even Minor Color Differences

High S/N Ratio System Design

Three N-Smart Technologies Work Together to Obtain a High S/N Ratio

The high luminance white LED of the Fiber Amplifier Unit, and the high luminance RGB three-color LEDs and high efficiency optical system design of the Photoelectric Sensor deliver high power. "Smart Noise Reduction" (a light reception algorithm) and "N-Core" (a high-speed, high-precision IC) work together to dramatically reduce the effect of noise. Increasing the incident level

and decreasing noise make it possible to obtain a high S/N ratio even when color differences are subtle.





Low Noise for

Small Signals Light Reception Algorithm

Smart Noise

Reduction

Accurately Capturing



Further Information

From Single Wavelengths to Color Sensing

The wavelength ranges for red, green, and blue are narrow, and combinations with other colors cannot be detected with RGB single-color light source sensors (Fig. 2). For the new Color Mark Sensors, the Photoelectric Sensor uses RGB three-color LEDs as the light source, and the Fiber Sensor uses a white LED that has a broad wavelength range. Color sensing makes stable detection possible—even for those color combinations that would be difficult using single wavelengths.

Color Mark Photoelectric Sensor (E3S-DC):

Three light sources (R, G, and B) in a single device



(Fig. 2)

Spectral Sensitivity Characteristics for Red, Green, Blue and White



*2. Based on degree to which brightness is felt for each wavelength when detecting light

Color Fiber Amplifier Unit (E3NX-CA): White LED light emitting element & RGB matrix light receiving element



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"I want stable detection of packaging even if the lot changes."

There are cases where colors of packaging materials vary from lot to lot. If the parameters are not changed, this could result in equipment stoppage caused by false detection. In such a case it can be difficult to determine the cause of the problem—resulting in time lost due to troubleshooting and a notable decrease in productivity.



E3S-DC/E3NX-CA

Existing challenges

Visualization of Variation in Colors Printed on Packaging Makes Troubleshooting





Visualization of Color Variation

RGB Data Transmission Function

RGB information for color marks and backgrounds for each lot is transmitted to a host and quantified. This information is then managed in a database, making it possible to set optimal thresholds and identify causes quickly if a problem occurs.





Test Parameter Support Function

The test parameter support function allows users to determine whether or not detection is possible for designs in the prototyping stage. Package designers and production engineers use quantified RGB digital data to discuss the designs, which allows them to reach a quick decision on which design to use—and helps shorten lead times from design to production line commissioning.

Examine values that can be detected based on RGB data, then provide feedback on the design.



*1 Made possible through using a function that transmits RGB data via IO-Link (for E3S-DS) or EtherCAT (for E3NX-CA) to build a system that covers everything from Sensors to the computer network.

MENO
MEMO

Color Mark Photoelectric Sensor E3S-DC

Color Mark Detection on Any Type of Packaging.

Narrow Beam and Large Lens for Stable **Detection of Workpieces Tilted at Various** Angles.

Detects subtle color differences.

High luminance, three-element (RGB) LED light source for greater light intensity. Highly efficient optics technology provides high power and enables stable detection even of subtle color differences.

- Handles glossy workpieces. Thorough noise reduction. High dynamic range covers everything from black to mirror surfaces.
- IoT compatible.

Models that support IO-Link also available. Sends RGB information to host with high-speed IO-Link communications.

Optimum threshold set to reduce false detection.

Refer to Safety Precautions on page 16.

Soncore (Defente Dimensione en nove 17)

Ordering Information



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

Sensors (Refer to <i>Dimensions</i> on page 17.)					Red light, Gree	en light, Blue light
Sensing method	Appearance	Connection method	Sensing distance	Output	Model	IO-Link baud rate *
				Puch-pull	E3S-DCP21-IL2	COM2 (38.4 kbps)
Diffuse-reflective (mark detection)		M12 connector	10+3 mm	i usii-puii	E3S-DCP21-IL3	COM3 (230.4 kbps)
				NPN	E3S-DCN21	Not supported

Note: Please contact your OMRON sales representative regarding the IO-Link setup file (IODD file). * Refer to Ratings and Specifications on page 12 for the baud rate.

Accessories (Sold Separately)

Sensor I/O Connectors (Required for a Sensor with a connector.) Connectors are not provided with the Sensors. Be sure to order a Connector separately.

Size	Туре	Арре	earance	Cable length	Model
		Straight		2 m	XS2F-D421-D80-F
M12 Socket and plug on cable ends *1		Bar	5 m	XS2F-D421-G80-F	
	L-shape	*2	2 m	XS2F-D422-D80-F	
			5 m	XS2F-D422-G80-F	
		Smartclick connector Straight/straight	2 m	XS5W-D421-D81-F	
	Socket and plug on		Ber	5 m	XS5W-D421-G81-F
	cable ends *1	Smartclick connector		2 m	XS5W-D422-D81-F
	L-shape/L-shape		5 m	XS5W-D422-G81-F	

Note: 1. Refer to Sensor I/O Connectors/Sensor Controllers on your OMRON website for details.

The XS2W (Socket and Plug on Cable Ends) and XS5F (Socket on One Cable End) are also available. 2. The connectors will not rotate after they are connected.

***1.** There are also straight type/L-shape type combinations available.

*2. The cable is fixed at an angle of 180° from the sensor emitter/receiver surface.

E3S-DC Ratings and Specifications

	Sensing method	Dif	d Diffuse-reflective (mark detection)				
	Output	Push	-pull	NPN			
Item	Model	E3S-DCP21-IL2	E3S-DCP21-IL3	E3S-DCN21			
Sensing distance		10 ± 3 mm (White paper 10 $\times 10$ n	וm)				
Spot size (reference	e value)	1 × 4 mm					
Light source (wave	length)	Red LED (635 nm), Green LED (525 nm), Blue LED (465 nm)				
Power supply volta	ge	10 to 30 VDC±10% (Ripple (p-p)	10% max.)				
Power consumption	า	960 mW max. (Reference: Powe	r supply voltage 24 V, Current co	onsumption 40 mA max.)			
Control output		Load current: 100 mA max. (30 VDC max.)					
Indications		Operation indicator (orange), RU 7-segment indicator (white), Key Timer indicator (white), 1-point te	N indicator (green), lock indicator (white), aching mode indicator (white)				
Operation mode		High when mark is detected.		ON when mark is detected.			
Protection circuits		Power supply reverse polarity pro connection protection	otection, output short-circuit prot	ection and output incorrect			
Response time		Operate or reset: 50 µs max. for Operate or reset: 150 µs max. for	each (2-point teaching mode) r each (1-point teaching mode)				
Sensitivity adjustment Teaching method							
Ambient illuminatio	n	Incandescent lamp: 3,000 lx max	•				
Ambient temperatu	re range	Operating: -10 to 55°C; Storage:	-25 to 70°C (with no icing or co	ndensation)			
Ambient humidity r	ange	Operation: 35% to 85%, Storage: 35% to 95% (with no condensation)					
Insulation resistance	e	20 MΩ min. (at 500 VDC)					
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min					
Vibration resistance	9	Destruction: 10 to 55 Hz with double amplitude of 1.5 mm for 2 hours each in X, Y, and Z directions					
Shock resistance		Destruction: 500 m/s ² 3 times each in X, Y, and Z directions					
Degree of protectio	n	IEC 60529 IP67					
Connection method		M12, 4-pin connector					
Weight (packed state/Sensor only)	Model with connector	Approx. 370 g/approx. 320 g					
	Case	Diecast zinc (nickel-plated brass)					
	Lens	Methacrylic resin (PMMA)					
Materials	Indicators	ABS					
	Buttons	Elastomers					
	Connector	Diecast zinc (nickel-plated brass)	·				
Main IO-Link functions		 Operation mode switching between NO and NC Timer function of the control output and timer time selecting function (Select a function from disabled, ON delay, OFF delay, one-shot or ON/OFF delay.) (Select a timer time of 1-5000 ms.) Selecting function of ON delay timer time for instability (0 (disabled)-1000 ms) Monitor output function (PD output indicating a relative detection quantity) Energizing time read-out function (unit: h) Initialize the settings function "Restore the factory settings" 					
	IO-Link specification	Version 1.1					
Communication specifications	Baud rate	E3S-DCP21-IL3: COM3 (230.4 k (38.4 kbps)	bps), E3S-DCP21-IL2: COM2				
	Data length	PD size: 8 bytes, OD size: 1 byte	(M-sequence type: TYPE_2_2)				
	Minimum cycle time	E3S-DCP21-IL3 (COM3): 1.5 ms,	E3S-DCP21-IL2 (COM2): 4.8 m	s			
Accessories		Instruction manual					

* Standard Sensing Object for the Mark Sensor

Color	Munsell code
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
(Black)	(N2.0)

Engineering Data (Reference Value)

Color vs. Detection Capability E3S-DC

Teaching Capabilities

\square	White	Red	Yellow -red	Yellow	Yellow -green	Green	Blue -green	Blue	Blue -purple	Purple	Red -purple	Black
White	$\overline{\ }$	Ο	0	0	0	0	0	0	0	0	0	0
Red	Ο	\geq	0	0	0	0	0	0	0	0	0	\bigcirc
Yellow -red	Ο	0	$\overline{\}$	0	0	0	0	0	0	0	0	Ο
Yellow	0	0	0	\setminus	0	0	0	0	0	0	0	\bigcirc
Yellow -green	0	0	0	0	$\overline{\ }$	0	0	0	0	0	0	0
Green	Ο	Ο	0	0	0	\geq	0	0	0	0	Ο	\bigcirc
Blue -green	Ο	Ο	0	0	0	Ο	\setminus	0	0	Ο	0	\bigcirc
Blue	Ο	Ο	0	0	Ο	Ο	\bigcirc	\land	0	Ο	0	\bigcirc
Blue -purple	0	0	0	0	0	0	0	0	$\overline{\ }$	0	0	0
Purple	Ο	Ο	0	0	0	0	0	0	0	\geq	0	\bigcirc
Red -purple	Ο	Ο	0	0	0	Ο	Ο	0	0	Ο	\setminus	\bigcirc
Black	Ô	0	0	Ó	Ó	Ô	Ô	Ó	Ó	Ô	0	$\overline{\ }$

Note: The above chart shows the combinations of colors for which teaching is possible at a sensing distance of 10 mm.

Detectable Ranges E3S-DC





Black





Detectable range (mm)



White



6.0

5.0

White Red Yellow-red

Yellow

Yellow-green Green Blue-green Blue Purple Red-purple

Black





Background color: Black Teaching distance: 10 mm



Excess Gain vs. Distance E3S-DC





Angle vs. Incident Characteristics E3S-DC







I/O Circuit Diagrams

Push-Pull Output

Model	Output mode	NO/NC setting *4	Timing chart	Output circuit	
E3S-DCP21-IL2 E3S-DCP21-IL2 E3S-DCP21-IL3	Standard I/O mode	NO *5	Sensing object Background Mark RUN indicator (Green) Lighting Operation indicator (Orrange) Not Lighting Pin 4 output (NO) Low HIGH Pin 2 output (NO) Low Load current (PNP connection) OFF ON OFF	Using Pin 2 as an external input *1 (enabled by default) Brown 1+V Black 4 C/O White OUT2 Blue 0 V	
	(SIO mode) (Pin 2 Output Settings)	(SIO mode) (Pin 2 Output Settings)	NC	Sensing object Background Mark RUN indicator (Green) Lighting I Operation indicator (Orange) Lighting I Pin 4 output (NC) HIGH Low Pin 2 output (NC) HIGH Low Load current (PNP connection) ON OFF Connection) OFF ON	Using Pin 2 with a control output *1 (set for IO-Link)
	IO-Link mode (Pin 2 Output – Settings)	NO *5	Sensing object RUN indicator (Green) (1 sec cycles Flashing) Background Mark Operation indicator (Orange) Not Lighting Lighting Pin 4 output (NO) (IO-Link communications) Low HIGH	Brown T+V Brown +V Black C/Q Black C/Q	
		NC	Sensing object Background Mark RUN indicator (Green) (1 sec cycles Flashing) Image: Comparison of the compar	Blue 30V Blue 30V IO-Link Master	

*1. Pin 2 input/output can be switched with the IO-Link communication command "Switchpoint Pin 2".

***2.** In case of NPN connection, please connect the load between Pin 1 and Pin 4. ***3.** In case of PNP connection, please connect the load between Pin 3 and Pin 4.

***4.** It can be switched in IO-Link.

*5. Factory default
Note: 1. You can use IO-Link communications to reverse the operation logic, set an output delay, and change between an input and output.
2. Please contact your OMRON sales representative regarding assignment of data.

NPN Output

Model	Timing chart	Output circuit
E3S-DCN21	Sensing object Background Mark RUN indicator (Green) Lighting Operation indicator (Orange) Not Lighting Lighting Pin 4 output (NO) OFF ON Load current OFF ON	Black 40 Black

Plugs (Sensor I/O Connectors)

M12, 4-pin Connector

	Terminal num	iber			
			<u> </u>	V	Vire color
$\mathcal{N}^{(2)}$	0	$-\Box$			-Brown
$\left(\Pi \right)$	8			(White
$(\bigcirc \bigcirc)$	4				FBlack
	Ŭ				

	M (1)	0	Appli	cation
Classification	color	pin No.	E3S-DCP21-IL2 E3S-DCP21-IL3	E3S-DCN21
	Brown	0	Power supply (+V)	Power supply (+V)
DC	White	2	External input *	External input
	Blue	3	Power supply (0 V)	Power supply (0 V)
	Black	4	Output C/Q	Control output

* It can be set as the control output with IO-Link.

E3S-DC Nomenclature

Operation indicator (Orange) Turns ON when the mark is detected. (when Pin 4 is set as NO)

7-segment indicator (White) Displays the BANK No. being selected.

> Key lock indicator (White) Turns ON when key locksetting is activated.

Timer indicator (White) Turns ON when timersetting is activated.

1-point teaching mode indicator (White) Turns ON when 1-point teaching mode.



RUN indicator (Green) Turns ON while power is supplied. Blinks during IO-Link communication.

Setup change [BANK] button Changes the BANK setting. (BANK NO.)

Sensitivity setting (Background) [BKGD] button Executes the background teaching.

Sensitivity setting (Mark) [MARK] button Executes the mark teaching.

Safety Precautions

Be sure to read the precautions for all models in the website at: http://www.ia.omron.com/.

Warning Indications

	Warning level Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally, there may be significant property damage.
Precautions for Safe Use	Supplementary comments on what to do or avoid doing, to use the product safely.
Precautions for Correct Use	Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.

Meaning of Product Safety Symbols

\bigcirc	General prohibition Indicates the instructions of unspecified prohibited action.
	Caution, explosion Indicates the possibility of explosion under specific conditions.
	Caution, fire Indicates the possibility of fire under specific conditions.
	General caution Indicates unspecified general alert.

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



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



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

Be sure to tighten the external lens until it reaches the chassis.



Precautions for Safe Use

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

- 1. Do not install the product in the following locations.
 - Locations subject to direct sunlight
 - Locations subject to condensation due to high humidity
 - · Locations subject to corrosive gas
 - In the place where vibration or shock is directly transmitted to the product.
- 2. Do not use the product in environments subject to flammable or explosive gases.
- 3. Do not use the product in any atmosphere or environment that exceeds the ratings.
- 4. Do not pull on the cable with excessive strength.
- 5. Do not attempt to disassemble, repair, or modify the product in any way.
- 6. Do not use the product with the main unit damaged.
- 7. Be sure that before making supply the supply voltage is less than the maximum rated supply voltage (30 VDC).
- 8. Do not apply any load exceeding the ratings.
- 9. Do not short the load. Otherwise damage or fire may result.
- 10. Connect the load correctly.
- 11. Do not use the product under a chemical or an oil environment without prior evaluation.
- 12. Though this is type IP67, do not use in the water, rain or outdoors.
- Do not use thinner, alcohol, or other organic solvents. Otherwise, the optical properties and degree of protection may be degraded.
- 14. When disposing of the product, treat it as industrial waste.
- 15. These Sensors are certificated for the UL standard on the assumption of usage in a Class 2 circuit. Use them with Class 2 power supplies in the United States or Canada. Use the OMRON XS2F-D4-series or XS5F-D4-series Cables. Cables that have wires less than AWG24 (0.2 mm²) are for connection to terminal blocks and are not for field splicing. External overcurrent protection of 1 A for AWG26, 2 A for AWG24, or 3 A for AWG22 wire must be provided for cable protection.

(Unit: mm)

Precautions for Correct Use

- 1. Note that the water-resistant function is impaired if installing the Photoelectric Sensor by hitting it with a hammer and so on.
- Be sure to tighten the external lens until it reaches the chassis.
 If the Sensor wiring is placed in the same conduits or ducts as high-voltage or high-power lines, inductive noise may cause malfunction or damage. Wire the cables separately or use a shielded cable.
- 4. To extend a cable in the standard I/O mode, use a cable of 0.3 mm² or more and keep the length 100 m or less. Keep the length 20 m or less if using the Sensor in the IO-Link mode.
- 5. Apply a screw tightening torque of 2.0 N·m or less.

- 6. If a commercial switching regulator is used, ground the FG (frame ground) terminal.
- The Sensor will be able to detect objects 100 ms after the power supply is tuned ON. Start using the Sensor 100 ms or more after turning ON the power supply. If the load and the Sensor are connected to separate power supplies, be sure to turn ON the Sensor first.
- 8. Do not press the button with anything sharp such as a screwdriver because it might be damaged.
- Output pulses may occur when the power supply is turned OFF. We recommend that you turn OFF the power supply to the load or load line first.

Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

Dimensions

Sensors



Note: 1. Apply a screw tightening torque of 2.0 N·m or less.

2. Be sure to tighten the external lens or cover until it reaches the chassis.

Color Fiber Amplifier Unit E3NX-CA

Smart Fiber Amplifier Units with White LEDs. High Color Discrimination Capability with the Same Easy Operation as Previous Fiber Amplifier Units. Existing General-purpose Fiber Units Can Be Connected.

• Detects subtle color differences.

The new white LED optic system increases the light intensity and the low-noise circuit in the Smart Fiber Amplifier Unit provides a surprising detection capability.

 Handles glossy workpieces.
 Smart Tuning lets you set the optimum sensitivity for detection with one simple operation.

• IoT compatible.

The detected RGB data can be displayed on the Amplifier Unit, and the Amplifier Unit for communications can transfer this data to the host in realtime.



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



Ordering Information

Fiber Amplifier Units (Refer to Dimensions on pages 31 and 32.)

Tuno	Annoaranaa	Connecting method	Innuto/outputo	Model			
туре	Appearance	Connecting method	inputs/outputs	NPN output	PNP output		
Standard models		Pre-wired (2 m)	1 output	E3NX-CA11 2M	E3NX-CA41 2M		
	C e s	Wire-saving Connector	1 output	E3NX-CA6	E3NX-CA8		
Advanced models		Pre-wired (2 m)	2 outputs + 1 input E3NX-CA21 2M		E3NX-CA51 2M		
Model for Sensor Communications Unit *		Connector for Sensor Communications Unit		E3NX-CA0			

* A Sensor Communications Unit is required if you want to use the Fiber Amplifier Unit on a network. **Note:** Refer to your OMRON website for details on models with wire-saving connectors.

Fiber Units (Refer to Dimensions on page 32.)

Sensing method	Appearance	Sensing direction	Size	Model
Reflective	9	Right-angle	M6	E32-C91N 2M
Through-beam (Grooved type)	hrough-beam Brooved type)		10 mm	E32-G16 2M

Note: Refer to Fiber Units on your OMRON website or to the Fiber Sensor Best Selection Catalog (Cat. No. E418-E1) for details on Fiber Units.

Accessories (Sold Separately)

Wire-saving Connectors (Required for models for Wire-saving Connectors.) (Refer to *Dimensions* on page 33.) Connectors are not provided with the Fiber Amplifier Unit and must be ordered separately. *Protective stickers are provided.

Туре	Appearance	Cable length	No. of conductors	Model	Applicable Fiber Amplifier Units	
Master Connector	*	2 m	3	E3X-CN11	E3NX-CA6	
Slave Connector	*	2 m	1	E3X-CN12	E3NX-CA8	

Note: Models are also available with a 5-m cable. The model names have the suffix 5M. Ask your OMRON representative for delivery times.

Mounting Bracket (Refer to Dimensions on page 33.)

A Mounting Bracket is not provided with the Fiber Amplifier Unit. It must be ordered separately as required.

Appearance	Model	Quantity
and the second	E39-L143	1

DIN Tracks (Refer to Dimensions on page 34.)

A DIN Track is not provided with the Fiber Amplifier Unit. It must be ordered separately as required.

Appearance	Туре	Model	Quantity
	Shallow type, total length: 1 m	PFP-100N	
000	Shallow type, total length: 0.5 m	PFP-50N	1
	Deep type, total length: 1 m	PFP-100N2	

Note: Refer to PFP- On your OMRON website for details.

End Plate (Refer to Dimensions on page 34.)

Two End Plates are provided with the Sensor Communications Unit.

End Plates are not provided with the Fiber Amplifier Unit. They must be ordered separately as required.

Appearance	Model	Quantity
-	PFP-M	1

Note: Refer to PFP-M on your OMRON website for details.

Related Products

Sensor Communications Units

Туре	Appearance	Model
Sensor Communications Unit for EtherCAT	and an and a second	E3NW-ECT
Distributed Sensor Unit	STATE OF	E3NW-DS

Note: Refer to your OMRON website for details.

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

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Ratings and Specifications

נד		Туре	Standard	l models	Advanced models	Model for Sensor Communications Unit *1			
		NPN output	E3NX-CA11	E3NX-CA6	E3NX-CA21				
		PNP output	E3NX-CA41	E3NX-CA8	E3NX-CA51	ESINA-CAU			
Item		Connecting method	Pre-wired	Wire-saving Connector	Pre-wired	Connector for Sensor Communications Unit			
Outputs			1 output		2 outputs	*3			
10	External input								
Light source (wavelength)			White LED (420	0 to 700 nm)					
Supply voltage			10 to 30 VDC, i	including 10% ri	ipple (p-p)	Supplied from the connector through the Sensor Communications Unit.			
Power consumption *4			At Power Supp Normal mode: Eco function O Eco function LO	ly Voltage of 24 960 mW max. (N: 720 mW max D: 800 mW max	VDC Current consumption: 40 mA m c. (Current consumption: 30 mA . (Current consumption: 33 mA	ax.) 1 max.) max.)			
Control output			Load power supply voltage: 30 VDC max., open-collector output Load current: Groups of 1 to 3 Amplifiers: 100 mA max., Groups of 4 to 30 Amplifiers: 20 mA max. (Residual voltage: At load current of less than 10 mA: 1 V max.) At load current of 10 to 100 mA: 2 V max.						
Indications			7-segment displays (Sub digital display: green, Main digital display: white) Display direction: Switchable between normal and reversed. OUT indicator (orange), NO/NC indicator (orange), Smart Tuning indicator (blue), and OUT selection indicator (orange, only on models with 2 outputs)						
Protection ci	rcuits		Power supply r protection, and	everse polarity output reverse	Power supply reverse polarity protection				
Sensing met	nod		Contrast Mode: Light intensity discrimination for RGB (initial state/after 2-point tuning) (R+G+B light intensity discrimination for 1-point tuning) Color Mode: RGB ratio discrimination						
	Super-high-speed	Mode (SHS) *5	Operate or rese	et: 50 μs (only ir	n Contrast Mode)				
Response	High-speed Mode	(HS)	Operate or reset: 250 µs						
time	Standard Mode (S	Stnd)	Operate or reset: 1 ms						
	Giga-power Mode	(GIGA)	Operate or rese	et: 16 ms					
Sensitivity adjustment			Smart Tuning (2-	point tuning, full a	autotuning, or 1-point tuning (1% to	99%)) or manual adjustment			
Maximum co	nnectable Units		30 Units 30 Units (When connecte OMRON NJ-series Unit)						
No. of Units	Super-high-speed	Mode (SHS) *5							
for mutual	High-speed Mode	(HS)	10 Units						
prevention	Standard Mode (S	Stnd)	10 Units						
*6	Giga-power Mode	(GIGA)	10 Units						

*1. The E3NW-ECT Sensor Communications Unit can be used, but the E3NW-CRT/CCL, E3X-DRT21-S, and E3X-CRT/ECT Sensor Communications Units cannot be used.

 $\boldsymbol{\ast2.}$ The following details apply to the input.

	Contact input (relay or switch)	Non-contact input (transistor)
NPN	ON: Shorted to 0 V (Sourcing current: 2 mA max.). OFF: Open or shorted to Vcc.	ON: 1.5 V max. (Sourcing current: 2 mA max.) OFF: Vcc - 1.5 V to Vcc (Leakage current: 0.1 mA max.)
PNP	ON: Shorted to Vcc (Sinking current: 3 mA max.). OFF: Open or shorted to 0 V.	ON: Vcc - 1.5 V to Vcc (sinking current: 3 mA max.) OFF: 1.5 V max. (Leakage current: 0.1 mA max.)

 $\mathbf{*3.}$ Two sensor outputs are allocated in the programmable logic controller (PLC) I/O table.

PLC operation via Communications Unit enables reading detected values and changing settings. *4. Power consumption

At Power Supply Voltage of 10 to 30 VDC Normal mode: 1,080 mW max. (Current consumption: 36 mA max. at 30 VDC, 74 mA max. at 10 VDC) Eco function ON: 840 mW max. (Current consumption: 28 mA max. at 30 VDC, 50mA max. at 10 VDC)

Eco function LO: 930 mW max. (Current consumption: 31 mA max. at 30 VDC, 55 mA max. at 10 VDC) *5. The mutual interference prevention function is disabled if the detection mode is set to Super-high-speed Mode.

*6. The tuning will not change the number of units.

The least unit count among the mutual interference prevention units of E3NX and E3NC. Check the mutual interference prevention unit count and response speed of each model.

		Туре	Standard models		Advanced models	Model for Sensor Communications Unit *1			
		NPN output	E3NX-CA11	E3NX-CA6	E3NX-CA21				
		PNP output	E3NX-CA41	E3NX-CA8	E3NX-CA51	ESNA-CAU			
Item		Connecting method	Pre-wired	Wire-saving Connector	Pre-wired	Connector for Sensor Communications Unit			
	Operation	mode	Contrast Mode: NO (Light-ON) or NC (Dark-ON) Color Mode: NO (ON for match: ON for same color as registered color) or NC (ON for mismatch: ON for different color from registered color)						
	Timer		Select from timer disabled, OFF-delay, ON-delay, one-shot, or ON-delay + OFF-delay timer (Counted by 0.1 s in a range of 0.1 to 0.5 ms, by 0.5 ms for 0.5 to 5 ms, and by 1 ms for 5 to 9999 ms. Default: 10 ms, Error: 0.1 ms)						
	Zero reset		Contrast Mode of Negative values	only can be displayed	I. (Threshold level is shifted.)				
	Resetting	settings *7	Select from initia	I reset (factory de	efaults), user reset (saved settings)	, or bank reset.			
	Eco mode		Select from OFF	(digital display lit), Eco ON (digital display not lit), an	d Eco LO (digital display dimmed).			
Functions	Bank swite	ching	Select from bank	ks 1 to 8.					
	Power tun	ing level	Set from 100 to 9 level.)	,999. (The RGB n	naximum incident level at Smart Tur	ning is adjusted to the power tuning			
	Output 2		-		Normal, error output, AND output, or OR output				
	External input				Select from input OFF, tuning, full- auto tuning, emission OFF, bank 1 and 2 switching, bank 1 through 8 switching, or zero reset.				
Changing the displays			Threshold level and incident level, channel number and incident level, RGB display and incident level, or bank display and incident level						
Ambient ille (Receiver s	umination ide)		Incandescent lamp: 20,000 lx max., Sunlight: 30,000 lx max.						
Ambient temperature range		range	Operating: Groups of 1 or 2 Groups of 3 to 1 Groups of 11 to Groups of 17 to Storage: -30 to	Amplifier Units: - 0 Amplifier Units: 16 Amplifier Units 30 Amplifier Units 70°C (with no icin	Operating: Groups of 1 or 2 Amplifier Units: 0 to 55°C, Groups of 3 to 10 Amplifier Units: 0 to 50°C, Groups of 11 to 16 Amplifier Units: 0 to 45°C, Groups of 17 to 30 Amplifier Units: 0 to 40°C Storage: –30 to 70°C (with no icing or condensation)				
Ambient hu	umidity rang	ge	Operating and st shown above	orage: 35% to 859	% (with no condensation) within the	surrounding air temperature range			
Installation	environme	ent	Pollution degree 3 (as per IEC 60947-1)						
Insulation r	resistance		20 MΩ min. (at 500 VDC)						
Dielectric s	trength		1,000 VAC at 50/60 Hz for 1 minute						
Vibration re	esistance		10 to 55 Hz with	a 1.5-mm double	e amplitude for 2 hours each in X, Y	, and Z directions			
Shock resistance (destruction)			500 m/s ² for 3 tir	nes each in X, Y,	and Z directions	150 m/s ² for 3 times each in X, Y, and Z directions			
Weight (pa	cked state/s	Sensor only)	Approx. 115 g/ approx. 75 g	Approx. 60g/ approx. 20g	Approx. 115 g/approx. 75 g	Approx. 65 g/approx. 25 g			
	Case		Polycarbonate (I	PC)					
Materials	Cover		Polycarbonate (I	PC)					
	Cable cov	ering	Polyvinyl chlorid	e (PVC)					
Accessorie	s		Instruction manual						

***7.** The bank is not reset by the user reset function or saved by the user save function.

Sensing Distances

Specifications

Hex-shaped Models

Туро					Sensing distance (mm)								
туре		Appearance (mm)	Bending radius	White paper				12-color discrimination				Model	
Sensing method	Size	Aperture angle		of cable (mm)	GIGA	ST	HS	SHS	GIGA	ST	HS	SHS	Model
Reflective	M6	60°	24 M6	Flexible, R4	90	45	30	13	18	9	6	4	E32-C91N 2M

Through-beam Models (Grooved Type)

	•		B	Sensing distance (mm)								
Туре	width	Appearance (mm)	of cable (mm)	(Opaque	e objec	t	Tra	ansluc	ent obj	ect	Model
	width		or cubic (min)	GIGA	ST	HS	SHS	GIGA	ST	HS	SHS	
Array	10 mm	71 20	R5				1	0				E32-G16 2M

Installation Information

		Installation				Waight				
Model	Ambient temperature	Tightening torque	Mounting hole	Bending radius (mm)	Cable nding is (mm) Unbendable length (mm) Tensile strength Shi mat R4 0 29.4 N Polyeti R5 0 * 29.4 N Polyeti		Sheath material	Core material	Emitter/ receiver differentiation	(packed state)
E32-C91N 2M	-40 to 70°C	0.98 N∙m	6.2 ^{+0.5} ₀ dia.	R4	0	29.4 N	Polyethylene	Plastic	White line on emitter cable	36 g
E32-G16 2M	-40 to 70°C	0.53 N·m		R5	0 *	29.4 N	Polyethylene	Plastic		51 g

 $\ensuremath{\boldsymbol{\ast}}$ The bending radius of the protective cover (PVC, 25 mm) is 10 mm min.

Hex-shaped Models

				Sensing distance (mm)								
Sensing		Aperture	Model	F Thro	eflective: V ugh-beam:	Vhite pape Opaque o	er, bject	Reflec Throug	tive: 12-col h-beam: Tra	or discrimi	ination, bject *1	
method	Size	angle	Model	GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed * 2	
Through-	M4	15°	E32-LT11N 2M (Built-in Lens)	980	510	350	140	190	100	70	44	
beam	IVI4		E32-T11N 2M	300	150	100	45	60	31	21	13	
	M3	60°	E32-C21N 2M	54	27	18	7	10	5	3.6	2.6	
	M4		E32-D21N 2M	90	45	30	13	18	9	6	4	
Reflective	M6	15°	E32-LD11N 2M (Built-in Lens)	88	44	29	13	17	8	5	4	
	M3	15°	E32-C31N 2M	12	6	4	1.8	2.4	1.2	0.8	0.6	
		60°	E32-C11N 2M	90	45	30	13	18	9	6	4	
Retro- reflective for transparent object detection	M6	15°	E32-LR11NP 2M (Built-in Lens) + E39-RP1 (Reflector, sold separately)	370	180	120	55	75	37	25	16	

*1. These sensing distances are recommended to make the most of the detection capabilities of the Sensor.

*2. The Super-high-speed Mode for 12-color discrimination with a Reflective Sensor or for detection of translucent objects with a Through-beam Sensor can be set only in Contrast Mode. The Super-high-speed Mode can not be set in Color Mode.

Threaded Models

						S	ensing dis	stance (mi	n)		
Sensing		Aperture		F Thro	Reflective: Wough-beam:	/hite pape Opaque o	r, bject	Reflec Throug	ctive: 12-colo h-beam: Tra	or discrimi	nation, bject <mark>*</mark> 1
method	Size	angle	Model	GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed *2
	M4	60°	E32-T11R 2M	300	150	100	45	60	31	21	13
I nrougn- beam		15° E	E32-LT11 2M (Built-in Lens)	1,150	600	410	170	230	120	82	52
boam			E32-LT11R 2M (Built-in Lens)	980	510	350	140	190	100	70	44
	Me		E32-LD11 2M (Built-in Lens)	92	46	30	13	18	9	6	4
	M6		E32-LD11R 2M (Built-in Lens)	88	44	29	13	17	8	5	4
Reflective	M3	60° E	E32-C31 2M	37	18	12	5	7	3.8	2.5	1.8
	M6		E32-D11R 2M	90	45	30	13	18	9	6	4
			E32-CC200 2M	150	75	50	22	30	15	10	7

Cylindrical Models

				Sensing distance (mm)								
Sensing	Sensing direction	Size	Model	F Thro	Reflective: V ough-beam:	/hite pape Opaque o	er, bject	Reflective: 12-color discrimination, Through-beam: Translucent object *1				
method				GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed *2	
	Top view	1.5 dia.	E32-T22B 2M	110	64	37	16	22	12	7	5	
i nrougn- beam	I op-view		E32-T12R 2M	300	150	100	45	60	31	21	13	
beam	Side-view	o ula.	E32-T14LR 2M	190	100	68	29	38	20	13	8	
Reflective	Top-view	1.5 dia.	E32-D22B 2M	17	8	6	2.4	3	2	1.2	0.7	
		2 dia	E32-D221B 2M	38	20	13	5	7	4	3	1.7	
		5 ula.	E32-D32L 2M	85	44	30	12	17	8	6	3.7	

Flat Models

			Sensing distance (mm)									
Sensing	Sensing	Model	Thr	Reflective: V ough-beam:	Vhite pape Opaque ol	r, bject	Refle Throug	ctive: 12-col Ih-beam: Tra	or discrimin	nation, bject <mark>*</mark> 1		
method	direction		GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed *2		
	Flat-view	E32-LT35Z 2M (Built-in Lens)	360	190	130	55	73	38	26	16		
Through-	Top-view	E32-T15XR 2M	300	150	100	45	60	31	21	13		
beam	Side-view	E32-T15YR 2M	190	100	68	29	38	20	13	8		
	Flat-view	E32-T15ZR 2M	190	100	68	29	38	20	13	8		
-	Top-view	E32-D15XR 2M	90	45	30	13	18	9	6	4		
Reflective	Side-view	E32-D15YR 2M	21	10	7	3.1	4.2	2.1	1.4	1		
	Flat-view	E32-D15ZR 2M	21	10	7	3.1	4.2	2.1	1.4	1		

Sleeve Models

			Sensing distance (mm)										
Sensing	Sensing	Model	l Thre	Reflective: V ough-beam:	Vhite paper Opaque of	r, oject	Reflective: 12-color discrimination, Through-beam: Translucent object *1						
method	direction		GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed <mark>*</mark> 2			
Through- beam	Top-view	E32-TC200BR 2M	300	150	100	45	60	31	21	13			
Reflective		E32-DC200BR 2M	E32-DC200BR 2M	90	45	30	13	18	9	6	4		

*1. These sensing distances are recommended to make the most of the detection capabilities of the Sensor.
*2. The Super-high-speed Mode for 12-color discrimination with a Reflective Sensor or for detection of translucent objects with a Through-beam Sensor can be set only in Contrast Mode. The Super-high-speed Mode can not be set in Color Mode.

Small-spot, Reflective Models

								Sensing o	listance (m	m)		
Sensing		Spot	Center			White	paper			12-color di	scriminatio	on
method	Туре	diameter	distance (mm)	Model	GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high-speed *2
	Integrated lens, long-distance, small-spot	6 dia.	50	E32-L15 2M	Spot diam Sensing d	eter of 6 mn istance of 40	n at 50 mm. 0 to 100 mm	۱.	Spot diam Sensing di	eter of 6 mm stance of 40	at 50 mm.) to 85 mm.	Spot diameter of 6 mm at 50 mm. Sensing distance of 40 to 60 mm.
Reflective	Parallel light	4 dia.	0 to 20	E32-C31 2M + E39-F3C	Spot diam	eter of 4 mm	n at 0 to 20	mm.	Spot diam mm. *3	eter of 4 mn	n at 1 to 9	
		0.5 dia	7	E32-C31 2M + E39-F3A-5	Spot diam mm.	eter of 0.5 n	nm at 7		Spot diam mm at 7 m	eter of 0.5 nm. * 3		
	Small-spot	0.5 ula.	17	E32-C31 2M + E39-F3B	Spot diameter of 0.5 mm at 17 mm.							
Sn	3 dia. 50 = E32-C2002 + E39-F18			E32-CC200 2M + E39-F18	¹ Spot diameter of 3 mm at 50 mm				Spot diameter of 3 mm at 50 mm. *3			

High-power Beam Models

						:	Sensing dis	stance (mn	n)		
Sensing	Sensing	Aperture			Opaque	e object			Translucen	t object * 1	
method	direction	angle	Model	GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed #2
	Top-view	10°	E32-T17L 10M	8,570	200	130	59	1,710	40	27	17
	Side-view	30°	E32-T14 2M	1,910	990	680	290	380	190	130	87
	Right-angle	12°	E32-T11N 2M +E39-F1	1,470	760	520	220	290	150	100	66
	Top-view	12°	E32-T11R 2M +E39-F1	1,470	760	520	220	290	150	100	66
Through-	Side-view	60°	E32-T11R 2M +E39-F2	180	98	67	28	37	19	13	8
beam	Top-view	12°	E32-T11 2M +E39-F1	2,430	1,260	860	360	480	250	170	110
-	Side-view	60°	E32-T11 2M +E39-F2	310	160	110	47	62	32	22	14
	Top-view	12°	E32-T61-S 2M +E39-F1	1,080	560	380	160	210	110	76	49
	Side-view	60°	E32-T61-S 2M +E39-F2	130	72	49	21	27	14	9	6

Narrow View Models

				Sensing distance (mm)								
Sensing	Sensing	Aperture angle 4°			Opaque	e object		Translucent object *1				
method	direction		Model	GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed #2	
Through- beam	Side-view		E32-T24S 2M	750	380	260	110	150	77	53	34	
			E32-T22S 2M	1,070	550	380	160	210	110	76	48	

Chemical-resistant, Oil-resistant Models

Sensing				Sensing distance (mm)								
	Type	Sensing	Model	F Thro	Reflective: V ough-beam:	Vhite pape Opaque o	er, bject	Reflee Throug	ctive: 12-col h-beam: Tra	or discrimi Inslucent o	nation, bject * 1	
method	1990	direction		GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed * 2	
	Chemical/oil resistant	Top-view	E32-T12F 2M	1,710	880	600	260	340	170	120	78	
Through			E32-T11F 2M	250	130	91	39	51	26	18	11	
beam		Side-view	E32-T14F 2M	210	110	76	32	42	22	15	9	
	Chemical/oil- resistant at 150°C	Top-view	E32-T51F 2M	770	400	270	110	150	80	54	35	
Reflective -	Chemical/oil resistant	Tonviow	E32-D12F 2M	49	24	16	7	9	5	3	2.4	
	Chemical-resistant cable	esistant e	E32-D11U 2M	90	45	30	13	18	9	6	4	

*1. These sensing distances are recommended to make the most of the detection capabilities of the Sensor.
*2. The Super-high-speed Mode for 12-color discrimination with a Reflective Sensor or for detection of translucent objects with a Through-beam Sensor can be set only in Contrast Mode. The Super-high-speed Mode can not be set in Color Mode. ***3.** The sensing distances are given for Contrast Mode. The sensing distance cannot be set in Color Mode.

Bending-resistant Models

						Sensing dis	tance (mm)		
Sensing	Size	Model	Thr	Reflective: V ough-beam:	Vhite pape Opaque ol	r, oject	Refle Throug	ctive: 12-col h-beam: Tra	or discrimir nslucent ol	nation, bject * 1
method	5126	Model	GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed * 2
	1.5 dia.	E32-T22B 2M	110	64	37	16	22	12	7	5
Through-	M3	E32-T21 2M	100	57	33	14	20	11	6	4
beam	M4	E32-T11 2M	380	200	130	58	77	40	27	17
	Square	E32-T25XB 2M	77	43	25	10	15	8	5	3.3
	1.5 dia.	E32-D22B 2M	17	8	6	2.4	3	2	1.2	0.7
	M3	E32-D21 2M	17	8	6	2.4	3.4	1.8	1.2	0.7
Dofloctivo	3 dia.	E32-D221B 2M	38	20	13	5	7	4	3	1.7
Reflective	M4	E32-D21B 2M	38	20	13	5	7	4	2.7	1.7
	M6	E32-D11 2M	90	45	30	13	18	9	6	4
	Square	E32-D25XB 2M	27	14	9	3.9	5	3	2	1.2

Heat-resistant Models

			Sensing distance (mm)									
Sensing method	Heat-resistant temperature	Model	Thr	Reflective: V ough-beam:	Vhite pape Opaque ol	r, bject	Reflective: 12-color discrimination, Through-beam: Translucent object *1					
			GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed * 2		
Thursday	150°	E32-T51 2M	420	220	150	65	85	44	30	19		
i nrougn- beam	heam 200°	E32-T81R-S 2M	150	80	54	23	30	16	10	7		
boun	350°	E32-T61-S 2M	250	130	91	39	51	26	18	11		
	150°	E32-D51 2M	120	60	40	17	24	12	8	5		
Reflective	200°	E32-D81R-S 2M	42	21	14	6	8	4.3	2.9	1.9		
	350°	E32-D61-S 2M	42	21	14	6	8	4	2.9	1.9		
	400°	E32-D73-S 2M	28	14	9	4	5	2.9	1.9	1.3		

Area Detection Models

		Sensing width	Model	Sensing distance (mm)								
Sensing method	Туре			Reflective: White paper, Through-beam: Opaque object				Reflective: 12-color discrimination, Through-beam: Translucent object *1				
				GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed #2	
Through- beam	Area		11 mm	E32-T16PR 2M	480	250	170	73	96	50	34	21
		Area	E32-T16JR 2M	410	210	140	63	83	43	29	19	
		30 mm	E32-T16WR 2M	730	210	140	63	140	43	29	19	
Reflective	Array	11 mm	E32-D36P1 2M	75	37	25	11	15	7	5	3.3	

Vacuum-resistant Models

				Sensing distance (mm)								
Sensing method	_	Heat-resistant	resistant		Opaque	e object		Translucent object *1				
	Туре	temperature	Model	GIGA	Standard	High- speed	Super- high- speed	GIGA	Standard	High- speed	Super- high- speed #2	
Through- Vacuum beam side	N/	m 120°	E32-T51V 1M	110	57	39	16	22	11	7	5	
	vacuum		E32-T51V 1M+E39-F1V	170	90	61	26	34	18	12	7	
	0100	200°	E32-T84SV 1M	270	140	97	41	54	28	19	12	

***1.** These sensing distances are recommended to make the most of the detection capabilities of the Sensor.

*2. The Super-high-speed Mode for 12-color discrimination with a Reflective Sensor or for detection of translucent objects with a Through-beam Sensor can be set only in Contrast Mode. The Super-high-speed Mode can not be set in Color Mode.

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Engineering Data (Reference Value)

Color vs. Detection Capability

E3NX-CA - + E32-CC200

	White	Red	Yellow/ red	Yellow	Yellow/ green	Green	Blue/ green	Blue	Blue/ purple	Purple	Red/ purple	Black*
White		0	0	0	0	0	0	0	0	0	0	(0)
Red	0		0	0	0	0	0	0	0	0	0	0
Yellow/ red	0	0		0	0	0	0	0	0	0	0	0
Yellow	0	0	0		0	0	0	0	0	0	0	0
Yellow/ green	0	0	0	0		0	0	0	0	0	0	0
Green	0	0	0	0	0		0	0	0	0	0	0
Blue/ green	0	0	0	0	0	0		0	0	0	0	0
Blue	0	0	0	0	0	0	0		0	0	0	0
Blue/ purple	0	0	0	0	0	0	0	0	\backslash	0	0	0
Purple	0	0	0	0	0	0	0	0	0	\searrow	0	0
Red/ purple	0	0	0	0	0	0	0	0	0	0		0
Black*	(0)	0	0	0	0	0	0	0	0	0	0	

High-speed Mode

Sensing distance: 10 mm (i.e., tuning distance)

 \bigcirc : Detection possible, \times : Detection not possible.

* Use Contrast Mode to distinguish between white and black.

Correlation vs. Distance

E3NX-CA + E32-CC200



Spot Diameter vs. Sensing Distance E3NX-CA + E32-L15









I/O Circuit Diagrams

NPN Output

Model	Operation mode	Timing chart	NO/NC indicator	Output circuit
E3NX-CA11	NO (Light-ON)	Incident light Operation indicator ON (orange) OFF Output ON transistor OFF Load Operate (e.g., relay) Reset (Between brown and black)	NO ON	Displays OUT1 indicator OUT2 indicator (orange)
E3NX-CA6	NC (Dark-ON)	Incident light No incident light Operation indicator ON (orange) OFF Output transistor OFF Load Operate (e.g., relay) Reset	NC ON	icituits input inpu

* The CA11 and CA6 have only control output 1. These models do not have control output 2 or an external input, so they do not have the OUT2 indicator.

PNP Output

Model	Operation mode	Timing chart	NO/NC indicator	Output circuit
E3NX-CA41	NO (Light-ON)	Incident light No incident light (orange) OFF Output ON transistor OFF Load Operate (e.g., relay) Reset (Between blue and black)	NO ON	Displays OUT1 indicator OUT2 indicator (orange) (orange) Pink External Pink Control Black orginal 1 = 10 to
E3NX-CA8	NC (Dark-ON)	Incident light Operation indicator ON (orange) OFF Output ON transistor OFF Load Operate (e.g., relay) Reset	NC) ON	Control Control Control Control Control Control Control Control Control Control Control Control Control Blue Control

* The CA41 and CA8 have only control output 1. These models do not have control output 2 or an external input, so they do not have the OUT2 indicator.

Note: 1. Timing Charts for Timer Function Settings (T: Set Time)

ON-delay Timer	OFF-delay Timer	One-shot Timer	ON/OFF-delay Timer
Delays the output ON after detection.	Holds the output ON for detection by PLC when the detection time is too short.	Keeps the output ON for a specified time regardless of the workpiece size variations.	Sets both OFF-delay Timer and ON- delay Timer.
No incident light ON → Ti→ L-ON OFF D-ON OFF	Incident light No incident light L-ON OF D-ON OF OF	Incident light No incident light L-ON OFF D-ON OFF D-ON OFF	Incident light No incident light L-ON OFF D-ON OFF

2. Timing Chart for Control Output (AND or OR) (T: Set Time)



Nomenclature



+-UP/DOWN Button

Used to fine-tune the threshold or change set values.

Safety Precautions

Be sure to read the precautions for all models in the website at: http://www.ia.omron.com/.

Warning Indications

	Warning level Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally, there may be significant property damage.
Precautions for Safe Use	Supplementary comments on what to do or avoid doing, to use the product safely.
Precautions for Correct Use	Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.

Meaning of Product Safety Symbols

\bigcirc	General prohibition Indicates the instructions of unspecified prohibited action.
	Caution, explosion Indicates the possibility of explosion under specific conditions.
	Caution, fire Indicates the possibility of fire under specific conditions.

A WARNING

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



Do not use the product with voltage in excess of the rated voltage.

Excess voltage may result in malfunction or fire.

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



Precautions for Safe Use

The following precautions must be observed to ensure safe operation of the product. Doing so may cause damage or fire.

- 1. Do not install the product in the following locations.
- · Locations subject to direct sunlight
- · Locations subject to condensation due to high humidity
- · Locations subject to corrosive gas
- Locations subject to vibration or mechanical shocks exceeding the rated values
- · Locations subject to exposure to water, oil, chemicals
- Locations subject to steam
- Locations subject to strong magnetic field or electric field
- 2. Do not use the product in environments subject to flammable or explosive gases.
- 3. Do not use the product in any atmosphere or environment that exceeds the ratings.
- 4. To secure the safety of operation and maintenance, do not install the product close to high-voltage devices and power devices.
- 5. High-Voltage lines and power lines must be wired separately from this product. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.
- 6. Do not apply any load exceeding the ratings. Otherwise damage or fire may result.
- 7. Do not short the load. Otherwise damage or fire may result.
- 8. Connect the load correctly.
- 9. Do not miswire such as the polarity of the power supply.

- 10. To use this device as connecting with each other, be sure to connect with the same power supply and turn ON the power simultaneously. Using a separate power supply will influence the functions when connecting the devices to use them.
- 11. Do not use the product if the case is damaged.
- 12. Burn injury may occur. The product surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Attention must be paid during operation or cleaning.
- 13. When setting the sensor, be sure to check safety such as by stopping the equipment.
- Be sure to turn off the power supply before connecting or disconnecting wires.
- 15. Do not attempt to disassemble, repair, or modify the product in any way.
- 16. When disposing of the product, treat it as industrial waste.
- 17. Do not use the Sensor in water, rain, or outdoors.
- 18. UL Standard Certification Only the Sensors with the Enhanced UL Certification Mark are certified by UL. They are intended to be supplied by a "Class 2 circuit". When used in United States and Canada, please use the same Class 2 source for input and output. The overcurrent protection current rating is 2 A max. They were evaluated as Open type and shall be installed within a enclosure.

Precautions for Correct Use

- 1. Be sure to mount the unit to the DIN track until it clicks.
- When using the Amplifier Units with Wire-saving Connectors, attach the protective stickers (provided with E3X-CN-series Connectors) on the unused power pins to prevent electrical shock and short circuiting. When using Amplifier Units with Connectors for Communications Units, attach the protective caps (provided with E3NW-series Sensor Communications Units).

Amplifier Unit with Wire-saving Connector Amplifier Unit with Connector for Communications Unit

Protective sticker Power supply connecting terminals



Protective cap

- Use an extension cable with a maximum length of 30 m. Be sure to use a cable of at least 0.3 mm² for extension. The power voltage must be 24 to 30 V when connecting Amplifier Units with extension cable and wire-saving connector.
- 4. Do not apply the forces on the cable exceeding the following limits:
- Pull: 40 N; torque: 0.1 N·m; pressure: 20 N; bending: 29.4 N 5. Use the E32- $\Box\Box$ Fiber Unit.
- Do not apply excessive force such as tension, compression or torsion to the Fiber Amplifier Unit with the Fiber Unit fixed to the Fiber Amplifier Unit.
- 7. Always keep the protective cover in place when using the product. Not doing so may cause malfunction.
- It may take time until the incident level and measurement value become stable immediately after the power is turned on depending on use environment.
- 9. The product is ready to operate 200 ms after the power supply is turned ON.
- 10. The Mobile Console E3X-MC11, E3X-MC11-SV2 and E3X-MC11-S cannot be connected.
- 11. The mutual interference prevention function does not work when in combination with E3C/E2C/E3X.
- 12. Excessive incident light cannot be sufficiently handled by the mutual interference prevention function and may cause malfunction. To prevent this, set a higher threshold level.
- 13. The Communication Unit E3X-DRT21-S, E3X-CRT, E3X-ECT and E3NW cannot be connected.
- 14. If you notice an abnormal condition such as a strange odor, extreme heating of the unit, or smoke, immediately stop using the product, turn off the power, and consult your dealer.
- 15. Do not use thinner, benzine, acetone, and lamp oil for cleaning.

Dimensions

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

Fiber Amplifier Units



Amplifier Units with Wire-saving Connectors E3NX-CA6



Amplifier Unit with Connector for Sensor Communications Unit

E3NX-CA0



Fiber Units



Accessories (Sold Separately)

Wire-saving Connectors

Master Connector E3X-CN11





* 4-dia. cable with 3 conductors, Standard cable length: 2 m (Conductor cross-section: 0.2 mm² (AWG24), Insulator diameter: 1.1 mm)





DIN Tracks PFP-100N

PFP-50N



Material: Aluminum

PFP-100N2



Material: Aluminum

End Plate









Materials: Iron, zinc plating

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