

NEW

# OMRON

## N-Smart

Presence Detection Measurement

Smart Fiber Amplifier Units (2-channel models)  
E3NX-MA

# Greater Flexibility in Equipment Design

Same size as the 1-ch model:

10 mm

Actual size



2-channel  
Amplifier  
reduces

installation space by

1/2

Space-saving and High Performance  
Downsized Equipment and Control Panels

Only OMRON  
provides a 2-ch  
amplifier that  
connects to two  
fiber units.\*



\* Based on November 2017 OMRON investigation.

EtherCAT®

CC-Link V2

# Downsized Equipment and Control Panels

This new 2-ch fiber amplifier unit has two-unit functions in the dimensions of the general one-unit. You need only half the number of units, substantially contributing to downsizing your equipment and control panels. Moreover, you can substantially reduce the purchase cost, wiring work, and power consumption.



General fiber amplifier units

Same number of fiber amplifiers as fiber units are required. Increased installation space prevents design flexibility.

Actual size



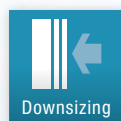
E3NX-MA 2-ch model

Space required  
for installation  
reduced by

50%

Larger space enhances design flexibility.

Additionally



**Downsizing the power supply  
is also possible.**

The reduction of power consumption by half\* also enables the downsizing of the power supply.

\* Compared with E3NX-FA.

## Stable detection

From transparent objects to low-reflective workpieces

# Performance with Highly Stable Detection even with Two Channels

## High Performance

### Sensing Distance

**4 m**

For E32-LT11 Fiber Unit with a fiber length of 3.5 m

### Minimum Sensing Object

**0.6  $\mu\text{m}$  dia.**

For E32-D11R Fiber Unit

## Technologies That Realize Basic Performance

## Powerful and Uniform Emission without Lost Light

HIGH-EFFICIENCY COUPLING ELEMENT

GIGA RAY2S

PAT

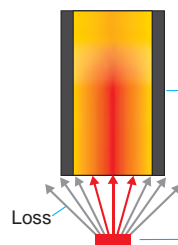
Optical Coupling Efficiency of

**40%**

Since the distance between the fiber and the LED is short, light is transmitted without loss. The lens and reflector emit powerful, uniform emission.

### FROM (without GIGA RAY)

Optical Coupling Efficiency of Only 10%



Fiber Units

GIGA RAY2S

LED

### TO

Optical Coupling Efficiency of 40%



Also, there are no variations in light intensity due to inconsistencies in Fiber Unit insertion.

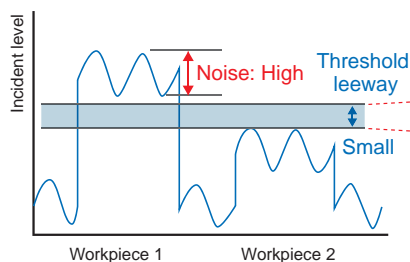
## Low Noise to Accurately Capture Signals

LIGHT RECEPTION ALGORITHM

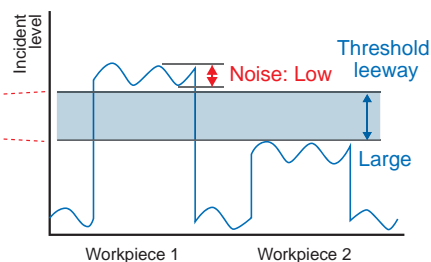
Smart Noise Reduction

The influences of noise are reduced to achieve stable incident light levels by increasing the number of samples taken. This increases the margin for threshold values to achieve stable detection.

### FROM (without Smart Noise Reduction)



### TO





## Easy operation

With the Press of a Single Button

# Anyone can Easily Set the Light Intensity and Threshold Automatically

Consistent Settings for All Users **Smart Tuning Settings** PAT

**E3NX-MA** Press the **S TUNE** button **once** with a workpiece and **once** without a workpiece

Automatically set the light intensity and threshold to optimum values in **1 Step**.

Threshold	Incident Level
5000	9999

Set to the intermediate value between the incident levels with and without a workpiece.

Incident level adjustment with and without a workpiece.

Automatic Adjustment to Optimum Incident Level **Wide Light Intensity Adjustment Range from Transparent Objects to Black Workpieces**

**Excessive Incident Level**

Transparent object

**Insufficient Incident Level**

Black workpiece

Light intensity reduced

Light intensity increased

$\times 1/2000$  ← Conventional Models\* ( $\times 1/100$ ) (Light intensity adjustment range)  $\times 1$  →  $\times 20$

Wider light intensity adjustment range of 40,000 times (Conventional models\*: 2,000 times)  
 You can automatically adjust the light intensity to an optimum value for stable detection even with saturated or insufficient incident light.

\*. E3X-HD

## Reliable function

# Two Decision Support Functions to Help You

Visual Displays of the Passing Time and Difference in Incident Levels.

**Solution Viewer** PAT

**Selecting Fiber Units**  
 Just about anyone can make a quantitative decision without special skills.

**A**

4.1 1003

Passing time Difference in incident level

**B**

4.1 4999

Passing time Difference in incident level

The difference in incident level is large, so use B.

**Setting Optimum Thresholds and Modes**

You can see the passing time and difference in incident levels to facilitate manual setup.

13.4 4000

Passing time Difference in incident level

The passing time is "13 ms", so it is OK with Standard Mode.

The incident light level difference is 4,000 when the level is 5,000 with a workpiece, so a threshold of 3,000 is OK.

Visual Information for Fast Workpieces **Change Finder** PAT

You can confirm changes in displayed values for fast workpieces to accurately set the threshold.

Before passing

While passing

Display could not keep up with the workpiece speed.

After passing

Conventional model

9999

9999

9999

**E3NX-MA**

9999

5000

5000

9999

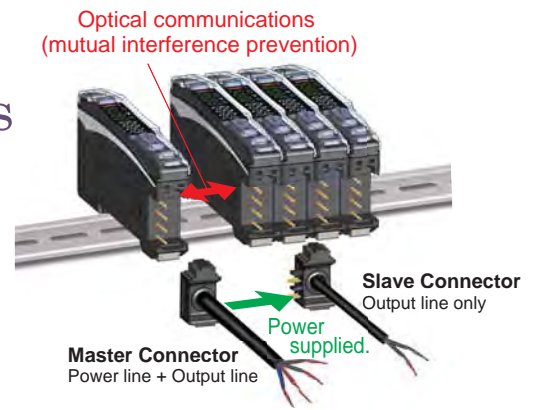
9999

The display value for the passing workpiece can be read.

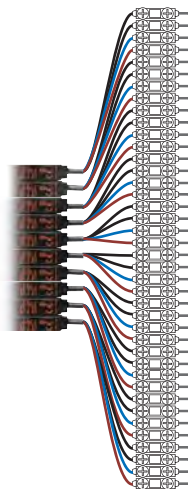
Displayed for 500 ms.

# Wire-saving Connector Models Reduce Wiring Work

Power is supplied from the Master Connector; the Slave Connectors have output lines only. Since there are no Master/Slave distinctions in amplifier units, you can unify the stock into one model type.



Conventional fiber amplifier units



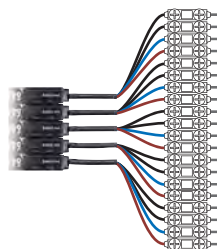
Total **30** lines

Output lines: 10  
Power lines: 2 lines x 10 units = 20 lines

Each amplifier unit requires power and output lines.

**E3NX-MA**

Pre-wired model



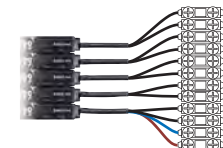
Total **20** lines

Output lines: 10  
Power lines: 2 lines x 5 units = 10 lines

Each amplifier unit requires power and output lines.

**E3NX-MA**

Wire-saving Connector model



Total **12** lines

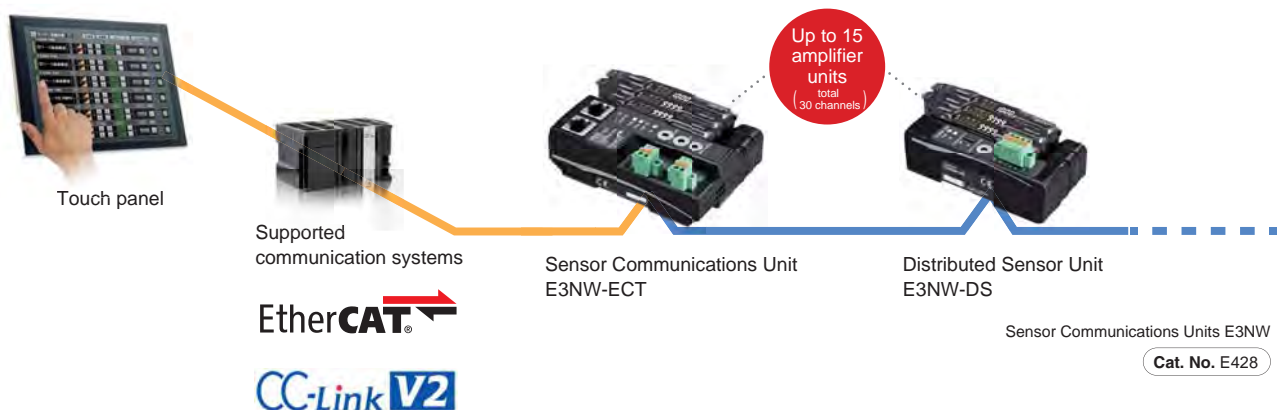
Output lines: 10  
Power lines: 2 lines x 1 units = 2 lines

Power is supplied to every amplifier unit via the Master Connector.

Reduction of wiring work by **60%** \* When connecting 10 channels.

## More Wire-saving and Improved Productivity with Network Communications

Use Sensor Communications Units to save more wiring and remotely control up to 15 amplifier units (total 30 channels). Full-view screen for 2-ch threshold and light intensity is available; Collective setting reduces equipment commissioning time. The system monitors equipment conditions for preventive maintenance, and reduces downtime in case of trouble, enabling safe and stable operation of equipment.

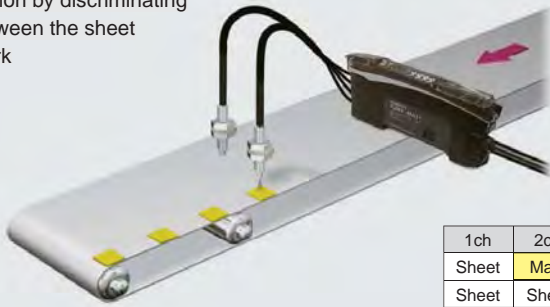


Control outputs through numerical or logical operations are possible.

## A Single Sensor can Handle a Wide Range of Applications

### Discrimination through numerical operations

Mark detection by discriminating the gap between the sheet and the mark



One single fiber amplifier can perform a numerical operation (difference) between two light intensities and discriminate based on the figure.

#### Operation example

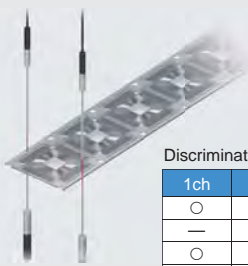
1ch	2ch	Operation result
1000	2000	-1000
5600	500	5100

### Control output through logical operations

Output of the logical operation results between 1-ch and 2-ch sensing is possible.

#### AND discrimination

Inspection of lead frame feeding position

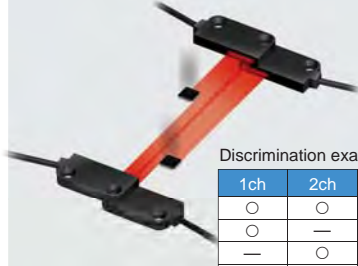


Discrimination example

1ch	2ch	Output
○	○	○
—	○	—
○	—	—
—	—	—

#### OR discrimination

Fall detection by using two area fiber units



Discrimination example

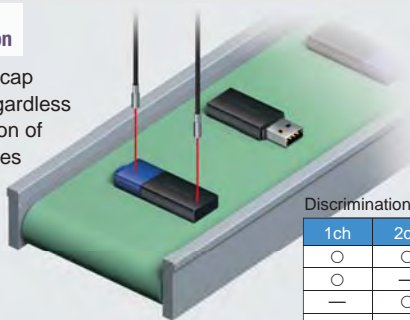
1ch	2ch	Output
○	○	○
○	—	○
—	○	○
—	—	—

One single fiber amplifier can provide control outputs based on AND operation or OR operation between two sensors, without using a PLC or a sensor controller.



#### XOR discrimination

Detection of cap presence regardless of the direction of the workpieces

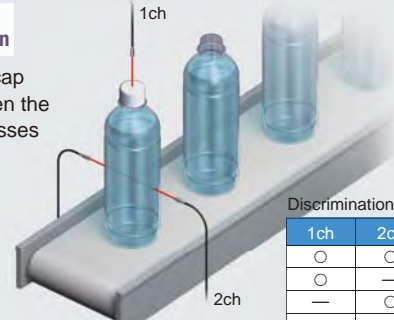


Discrimination example

1ch	2ch	Output
○	○	—
○	—	○
—	○	○
—	—	—

#### Rising synchronization

Detection of cap presence when the workpiece passes



Discrimination example

1ch	2ch	Output
○	○	○
○	—	—
—	○	—
—	—	—

#### Reference

#### Output pattern of logical operations

Outputs discriminating the combination of operational results are possible: AND operation outputs when both 1ch and 2ch are turned ON, OR operation outputs when either 1ch or 2ch is turned ON, and XOR operation outputs when only either 1ch or 2ch is turned ON.

Discrimination		Output		
1ch	2ch	AND	OR	XOR
○	○	○	○	×
○	×	×	○	○
×	○	×	○	○
×	×	×	×	×




1ch 2ch

1ch 2ch

1ch 2ch

## Ordering Information

### Fiber Amplifier Units

Type		Connecting method	Appearance	Inputs/outputs	Model	
					NPN output	PNP output
2-channel models	Standard Type	Pre-wired (2 m)		2 outputs	E3NX-MA11	E3NX-MA41
		Wire-saving Connector		2 outputs	E3NX-MA6	E3NX-MA8
	Model for Sensor Communications Unit *	Connector for Sensor Communications Unit		---	E3NX-MA0	

\* A Sensor Communications Unit is required if you want to use the Fiber Amplifier Unit on a network.

### Accessories (Sold Separately)

#### Wire-saving Connectors

(Required for models for Wire-saving Connectors.)

Connectors are not provided with the Fiber Amplifier Unit and must be ordered separately. Note: Protective stickers are attached. Cable length is 2 m.

Type	No. of conductors	Model	Applicable Fiber Amplifier Units
Master Connector	4	E3X-CN21	E3NX-MA6
Slave Connector	2	E3X-CN22	E3NX-MA8

### Related Products

#### Sensor Communications Units

Type	Model
Sensor Communications Unit for EtherCAT	E3NW-ECT
Sensor Communications Unit for CC-Link	E3NW-CCL
Distributed Sensor Unit *	E3NW-DS

Refer to your OMRON website for details.

\* The Distributed Sensor Unit can be connected to any of the Sensor Communications Units.

## Ratings and Specifications

Type		Standard Type		Model for Sensor Communications Unit
		E3NX-MA11	E3NX-MA6	E3NX-MA0
Item	NPN output	E3NX-MA41	E3NX-MA8	
	PNP output			
	Connecting method	Pre-wired	Wire-saving Connector	Connector for Sensor Communications Unit
Inputs/ outputs	Outputs	2 outputs		---
	External inputs	---	---	
Light source (wavelength)		Red, 4-element LED (625 nm)		
Power supply voltage		10 to 30 VDC, including 10% ripple (p-p)		Supplied from the connector through the Sensor Communications Unit
Power consumption		At Power supply voltage of 24 VDC Normal mode : 960 mW max. (Current consumption at 40 mA max.) Eco function ON: 770 mW max. (Current consumption at 32 mA max.) Eco function LO : 870 mW max. (Current consumption at 36 mA max.)		
Control output		Load power supply voltage: 30 VDC max., open-collector output (depends on the NPN/PNP output format) Load current: Groups of 1 to 3 Amplifier Units: 100 mA max., Groups of 4 to 30 Amplifier Units: 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. ) OFF current: 0.1 mA max.		---
Response time	Super-high-speed mode (SHS)	Operate or reset: 100 μs		
	High-speed mode (HS)	Operate or reset: 450 μs		
	Standard mode (Std)	Operate or reset: 1ms		
	Giga-power mode (GIGA)	Operate or reset: 16ms		
No. of Units for mutual interference prevention		9 Note: The mutual interference prevention function is disabled if the detection mode is set to super-high-speed mode.		
Functions		Auto power control (APC), dynamic power control (DPC), timer, zero reset, resetting settings, eco mode, bank switching, power tuning, and hysteresis width		

**Note:** For details, refer to the Smart Fiber Amplifier Units E3NX-MA Datasheet (Cat No.E467)





\* For performance (sensing distance and minimum sensing object) based on November 2017 OMRON investigation.

### Common Features and Models in the N-Smart Series

Common Buttons

Intuitive Operation and Easy Setup.



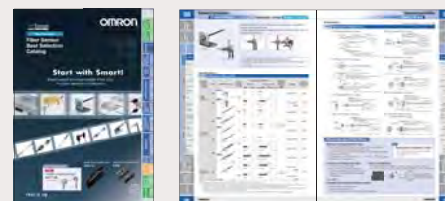
White Characters on a Black background

High-contrast displays for easy visibility from a distance.

For the Fiber Sensor lineup, see

### Fiber Sensor Best Selection Catalog

With this one you can select the optimum Fiber Unit and Fiber Amplifier Unit!



Cat. No. E418

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