OMRON

E3X-DA-S

Digital Fiber Sensors

Perfection Transcended!
A Wealth of Advanced Functions for Easy and Reliable Application

Innovation in the Solution Age

OMRON INDUSTRIAL AUTOMATION

Evolution and Perfection

The next-generation platform for a wide range of sensing

point 1
The industry's first Power Tuning Function in a digital sensor.

point 2
Large, Easy-to-Read Displays that are clear even from a distance.
Seven convenient display formats.

point 3
Stable long-term performance achieved with
OMRON's Auto Power Control (APC) function.

point 4
A wide array of Advanced Functions for even more applications.

point 5
The same Ease-of-Use as the E3X-DA-N Amplifier.

point 6
Environmentally
Friendly design.

point 7
Improved Mobile Console.

Smart Style!

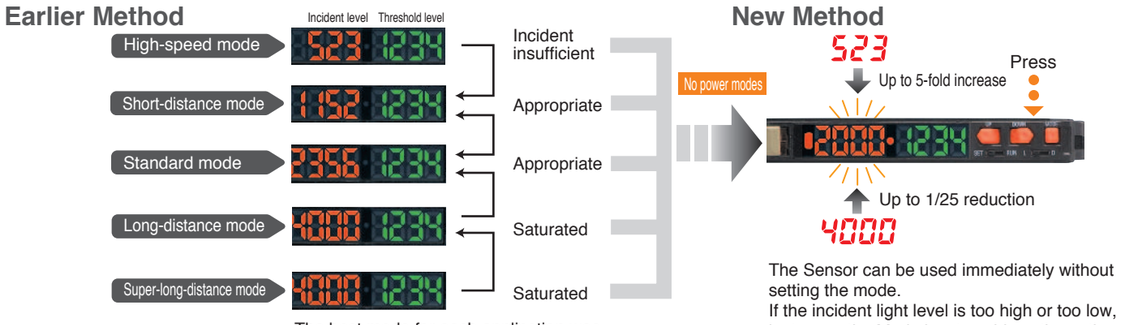
point 1

Industry's First Power Tuning Function in a Digital Sensor.

No complicated mode settings.

Patent Pending

Troublesome power adjustments have been eliminated, so it isn't necessary to select from power mode settings, such as long-distance mode, standard mode, and short-distance mode. When the MODE Key is pressed once, the power tuning function shifts the power level so that the present incident level is set to the ideal level (2000 on the digital display.)

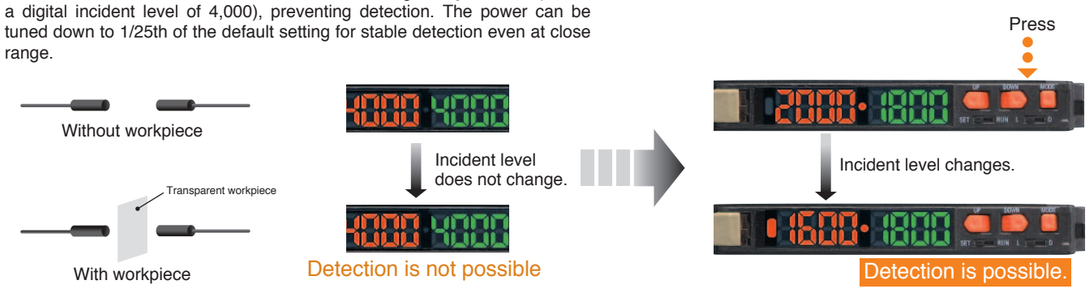


The best mode for each application was selected from several power modes.

The Sensor can be used immediately without setting the mode.
If the incident light level is too high or too low, just press the Mode key to achieve the optimum status.

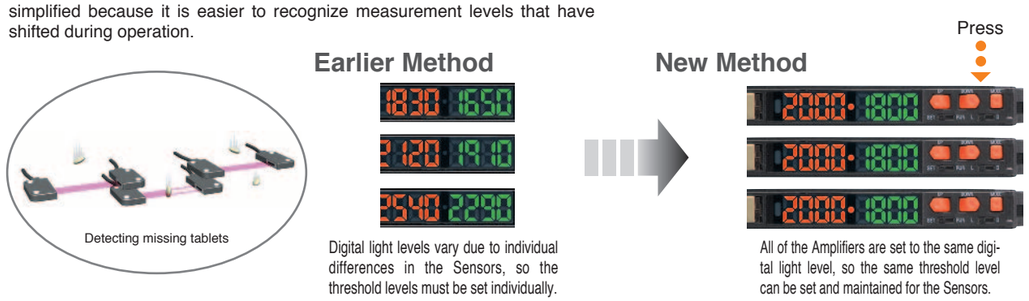
Insufficient light or saturation at short distances can be corrected.

The power tuning range is extended to the allowable limits to eliminate problems such as insufficient light or detection failures due to saturation.
If the installation distance is too short, the incident light may saturate (i.e., to a digital incident level of 4,000), preventing detection. The power can be tuned down to 1/25th of the default setting for stable detection even at close range.



Variations between different Sensors can be eliminated.

Threshold levels had to be set and maintained separately for individual Sensors due to variations in the digital light levels measured by each Sensor. With power tuning, the incident level can be fine-tuned so the same threshold level can be set for each Sensor in an application. Maintenance is also simplified because it is easier to recognize measurement levels that have shifted during operation.



Digital light levels vary due to individual differences in the Sensors, so the threshold levels must be set individually.

All of the Amplifiers are set to the same digital light level, so the same threshold level can be set and maintained for the Sensors.

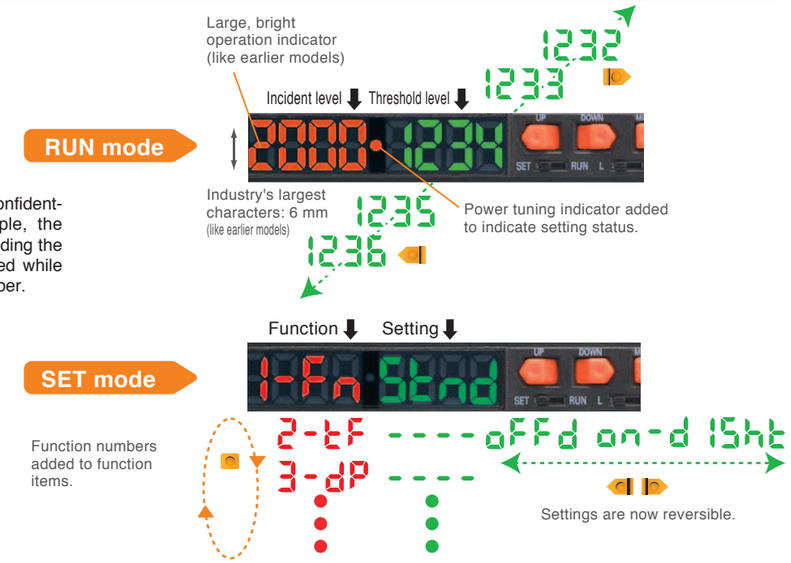
Smart Style!

point 2

Large, Easy-to-Read Displays: Clear Even from a Distance

The displays are large and easy-to-read, despite the small case.

Settings can be made more simply and confidently with two digital displays. For example, the threshold value can be changed while reading the incident level or a setting can be changed while confirming the setting's function item number.



Seven Convenient Display Formats

Patent Pending

An incident level/threshold display, percentage/threshold display, and large bar graph display have been added, so you can select the best display method for the application.

Incident Level/Threshold Display

Incident level Threshold level

Change the threshold level while reading the incident level.

Percentage/Threshold Display

Incident level Threshold level

Verify the difference between the incident level and threshold level while setting the threshold level.

Large Bar Graph Display

Incident light — No incident light

Bar display

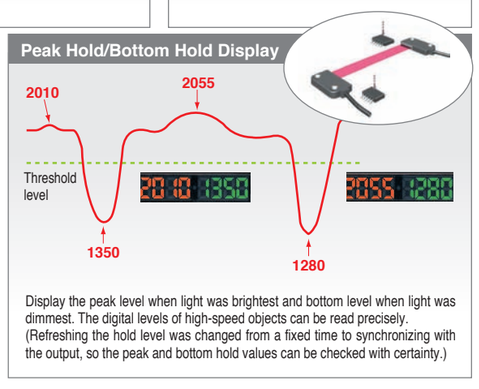
Check the incident level intuitively. Ideal when it is better to view an analog display instead of the actual digital level.

Incident Level/Peak Hold Display

Incident level Peak hold

Simultaneously display the peak hold level and present incident level. The optical axis can be adjusted more easily and surely by checking the peak hold level while adjusting the optical axis.

Peak Hold/Bottom Hold Display



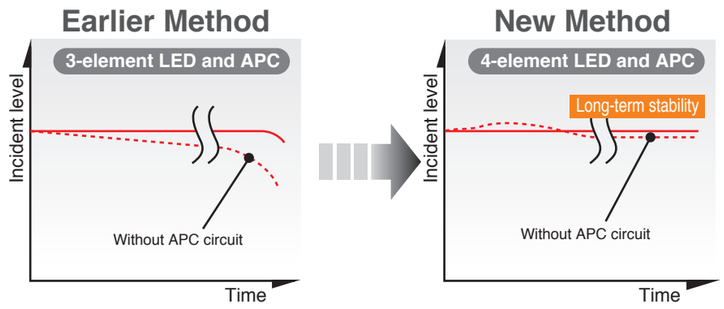
Display the peak level when light was brightest and bottom level when light was dimmest. The digital levels of high-speed objects can be read precisely. (Refreshing the hold level was changed from a fixed time to synchronizing with the output, so the peak and bottom hold values can be checked with certainty.)

Stable, Long-term Performance with OMRON's APC Function

OMRON provides the industry's most stable long-term detection by using new 4-element LEDs and an APC (Auto Power Control) circuit.

Highest Level of Stability

In addition to our unique APC circuit used in the E3X-DA-N Amplifiers to compensate for the deterioration of the LED, the E3X-DA-S uses 4-element LEDs to counteract the deterioration of the light-emitting elements over time and achieve the industry's most stable long-term detection performance.
Furthermore, the circuit is designed with excess light capacity, so the Sensors can be used with high stability regardless of whether the APC circuit is ON or OFF.



Compensate for the effects of contaminants and temperature variation with differential operation mode. (Advanced Models)

This operation mode uses a special OMRON algorithm to compensate for slight light level changes due to dirt or temperature variations and detect only the light level changes due to the workpiece.

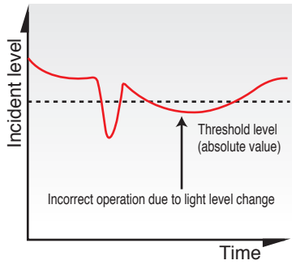
Slight light level changes can be detected with stability and precision, eliminating the need for time-consuming manual adjustments for light level changes.

With the Twin-output Amplifiers, output 2 can function as an alarm output (light level operation) to indicate when the light level has changed due to dirt or other causes.

Patent Pending

Light Level Operation (Normal Operation)

Judges light level changes by comparing the incident level and threshold level.

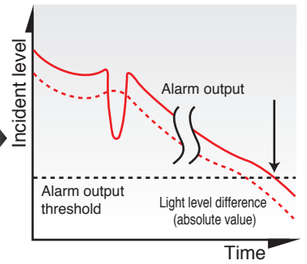


The light level varies due to dirt, temperature variations, or other environmental factors.

Incorrect operation

Differential Operation

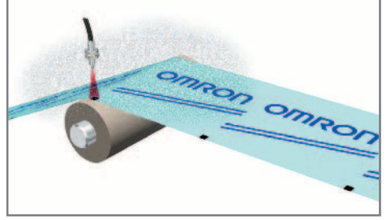
Judges light level changes by comparing the incident level to a time-averaged incident level.



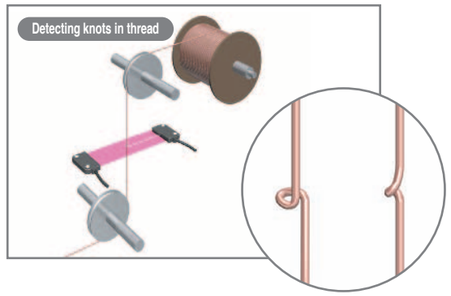
Detecting differences in the light level enables setting more subtle light level differences.

Minute changes are detected reliably.

Detecting marks in a dusty environment



Detecting knots in thread



Many Advanced Functions for Even More Applications

In super-high-speed mode, it is the fastest digital model at 48 μs. (Standard Models)

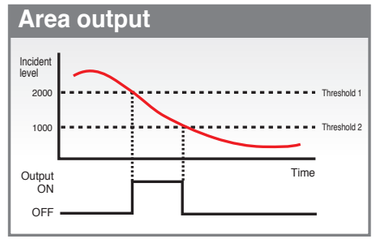
Fastest in the Industry

Provides high-speed response for miniature workpieces, such as chip parts and devices with short tact times.

Three kinds of timer functions are supported. The timers can be set between 1 ms and 5 s.
A one-shot timer is supported in addition to the ON-delay and OFF-delay timers.
The Amplifier's ON time can be fixed, which is useful during high-speed workpiece detection.

Area output function can be used for range judgement. (Advanced Twin-output Models)

Operations that required multiple Sensors, such as height measurement, can be performed with just one Sensor. Two threshold levels can be set to easily output within-range and out-of-range outputs.



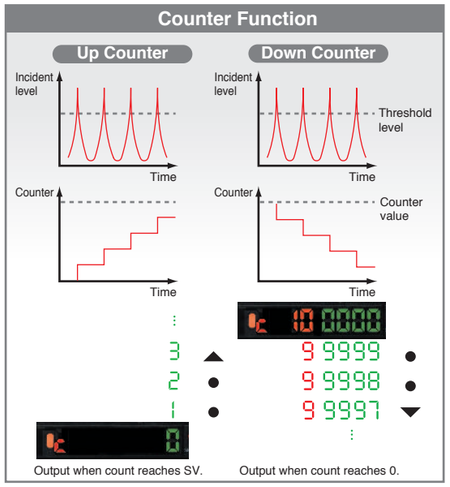
Remote input function can control the Sensor remotely. (Advanced External-input Models)

Input signals can make various remote settings, such as teaching operations, power tuning, and emitter OFF. This model is ideal for diverse needs, such as checking Sensor operation remotely before operation or making settings remotely because teaching has to be performed often for frequent workpiece model changes.

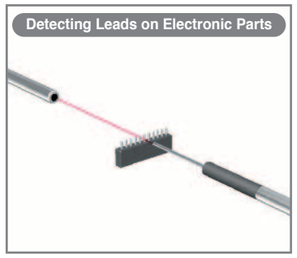
The counter function can output signal after counter counts up or down. (Advanced External-input Models)

Patent Pending

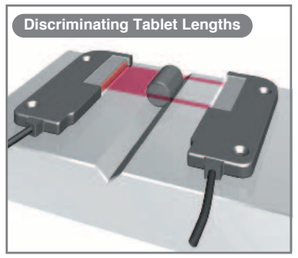
A counter function is built-in, so the number of workpieces can be counted without a separate counter or small PLC that used to be required.



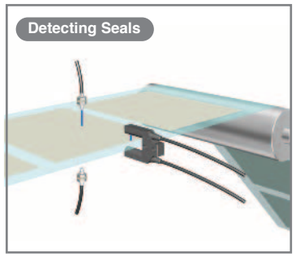
Detecting Leads on Electronic Parts



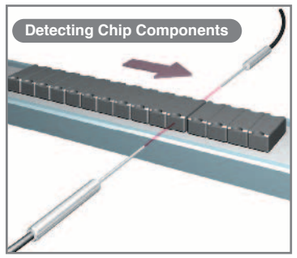
Discriminating Tablet Lengths



Detecting Seals



Detecting Chip Components



The Same Ease-of-Use as the E3X-DA-N

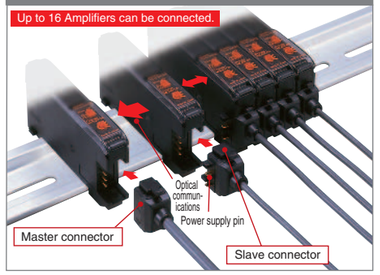
The E3X-DA-S uses OMRON's own simplified wiring connectors that were introduced with the E3X-DA-N.

Patent Pending
Japan patent number 3266198

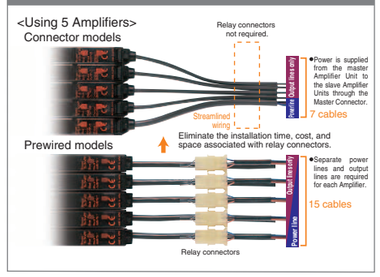
In Amplifiers with Connectors, the power supply is distributed to slave connectors through a single master connector. This design has three major advantages.

1. Wiring time is significantly reduced.
2. Relay connectors are unnecessary, so wiring takes up less space.
3. Storage and maintenance are simpler because it isn't necessary to distinguish between master connector and slave connectors on the Amplifier.

Simplified Connector Design

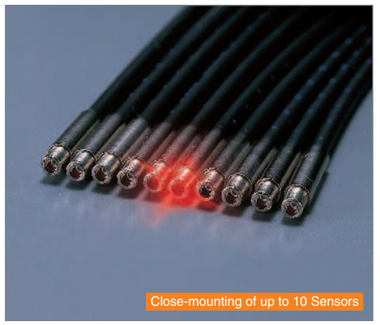


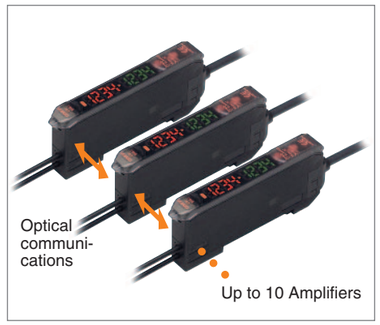
Reduced Power Wiring Saves Space



Optical communications prevents mutual interference.

Mutual interference is prevented with optical communications, so up to 10 Amplifiers can be mounted together.
(The number of Amplifiers depends on the operating conditions.)

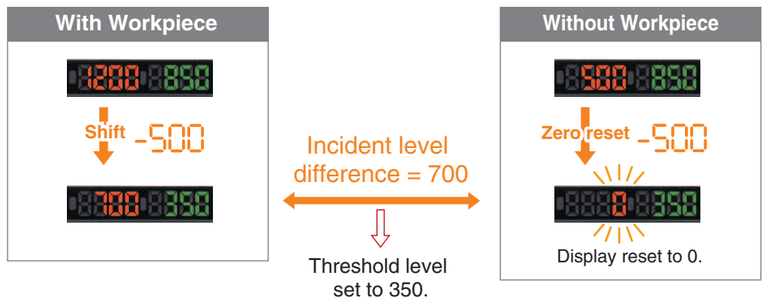




Zero reset function immediately resets the digital display to 0.

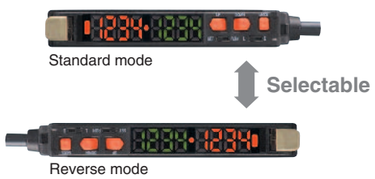
Patent Pending
Japan patent number 3255229

The zero reset function can immediately reset the digital display to 0 at any time. By setting the reference value to 0, the threshold value can be set while monitoring differences in incident light levels. The threshold value will also shift simultaneously when the zero reset button is pressed.



Reversible Digital Display (Reverse Mode)

The digital display can be reversed to match the Amplifier's mounting direction.



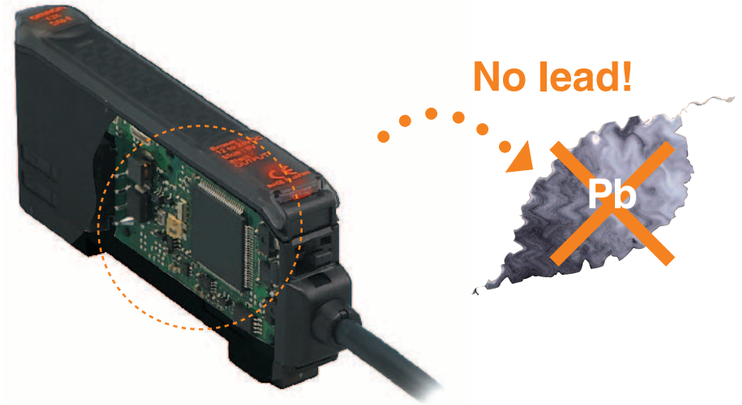
Environmentally Friendly Design

Environmentally friendly features are essential in truly high-performance products.

1 Materials containing lead have been completely eliminated. First in the industry

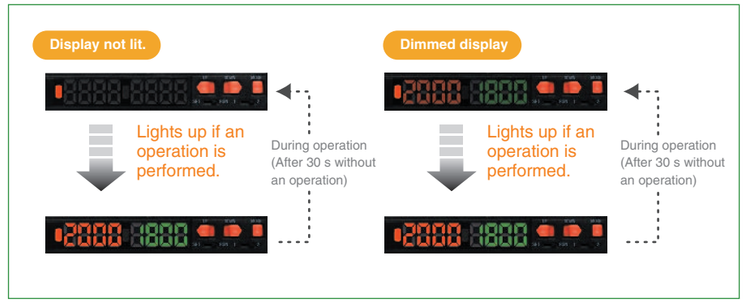
The Fiber Sensor is the first in the industry to use environmentally friendly lead-free solder.

eco
This ECO label is indicated on products that meet the environmental standards established by OMRON.



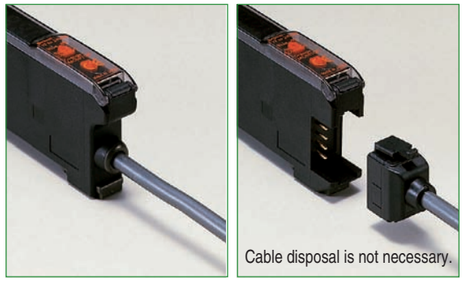
2 The digital display can be turned OFF or dimmed during operation. Eco-mode

When the digital display is viewed infrequently during operation, current consumption can be reduced by dimming the display or turning it OFF entirely.
The display will light up again automatically when an operation key is touched. (Eco-mode can be set from the Mobile Console only.)



3 Cable disposal is not required during maintenance.

In addition to saving space and reducing wiring time, the new connector design eliminates the need to dispose of cables together with the Amplifiers.



Further Improvements to the Mobile Console

E3X-DA-S
Digital Fiber Sensor

E3X-MC-S
Mobile Console

Can also be used with Photoelectric Sensors with Separate Digital Amplifiers.

E3C-LDA
Photoelectric Sensor with Separate Digital Amplifier

Group Power Tuning

Easily set multiple Sensors.

With the group power tuning function, power tuning is possible for multiple Sensors at the same time.

Improved Mode Lock Function

The Age of User-customizable Sensors.

Settings can be customized for different applications by locking out unnecessary function blocks within function settings.

Application		Function Block		
		Manual setting	Teaching	Function setting
Manual	Set for manual operation.	Operation OK	Locked	Locked
Teaching	Set for teaching operation.	Locked	Operation OK	Locked
Teaching + Manual	Set for teaching + manual operation.	Operation OK	Operation OK	Locked

Retains all of the Previous Advantages of the Mobile Console.

New and Improved Fiber Sensor and Mobile Console.

Settings, teaching, and fine-tuning can be performed at the fiber tip.

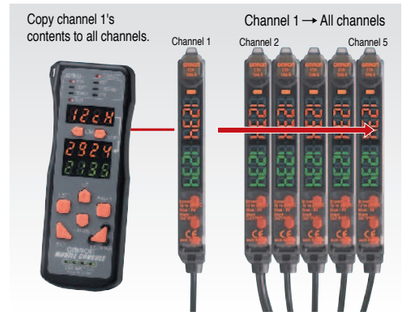
The Mobile Console can be used for settings and teaching at the tip of the fiber. Difficult adjustments can be made while checking the workpiece position.
Even if the Amplifier and Sensor head are separated during operation, it is still possible to flash the Sensor head and display the amplifier channels.

With Group Teaching, Teach Multiple Amplifiers Simultaneously.

The tedious teaching that had to be performed separately for each Amplifier can now be performed for several Amplifiers at once using the Mobile Console.

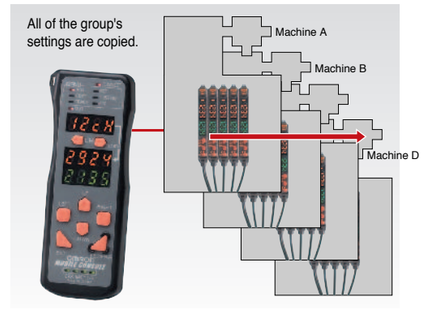
Copying Settings within the Same Group

Settings such as mode or threshold settings in an Amplifier or bank can be copied to all of the Amplifiers in the same group.



Copying Settings to Other Groups

The settings for a group of Amplifiers on one machine can be copied to a group of Amplifiers on another machine.
(The settings can also be copied to and from banks.)



In the interest of product improvement, specifications are subject to change without notice.

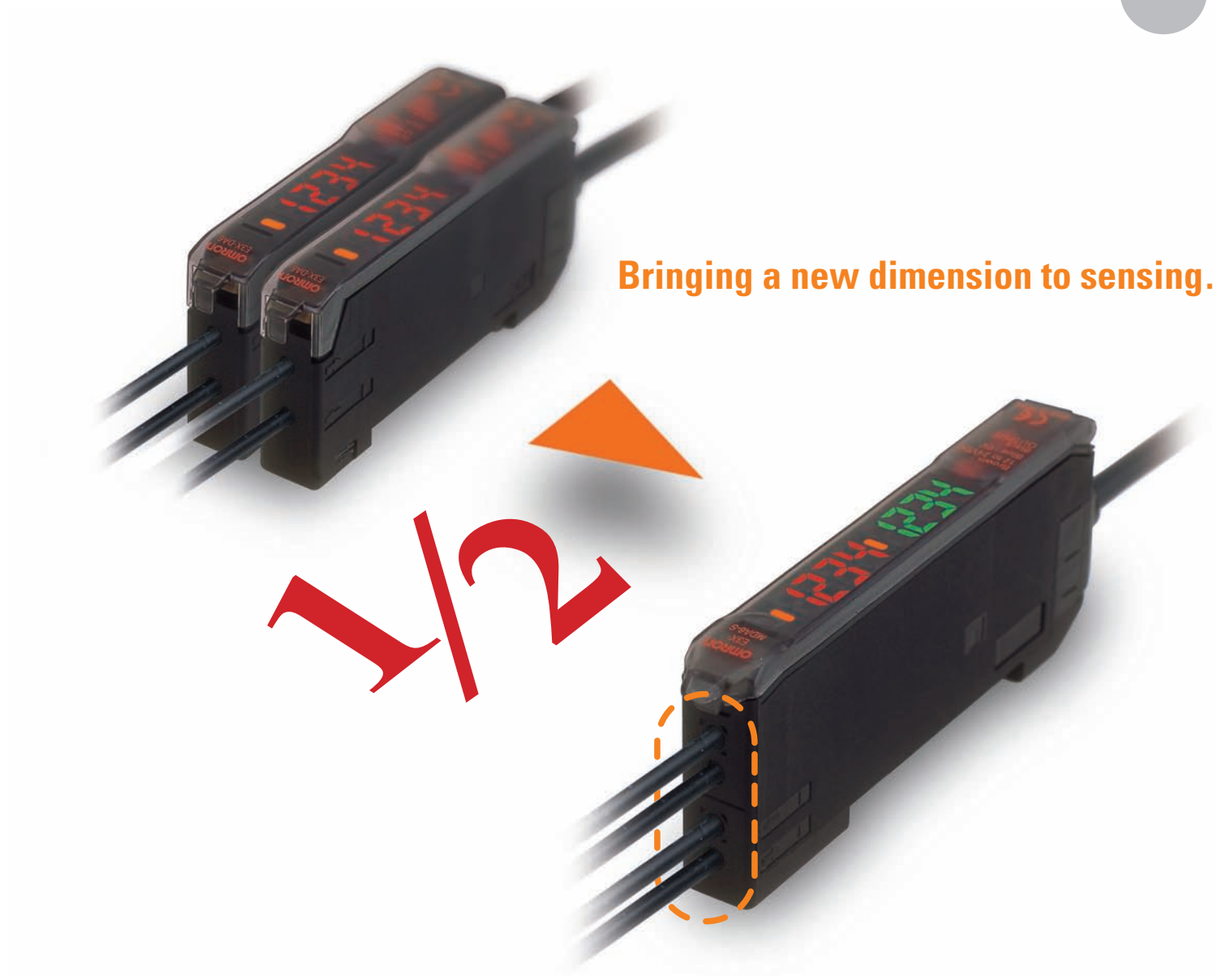
Authorized Distributor:

This document provides information mainly for selecting suitable models. Please read the Instruction Sheet carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

OMRON

E3X-MDA

Super Dual Fiber Sensor



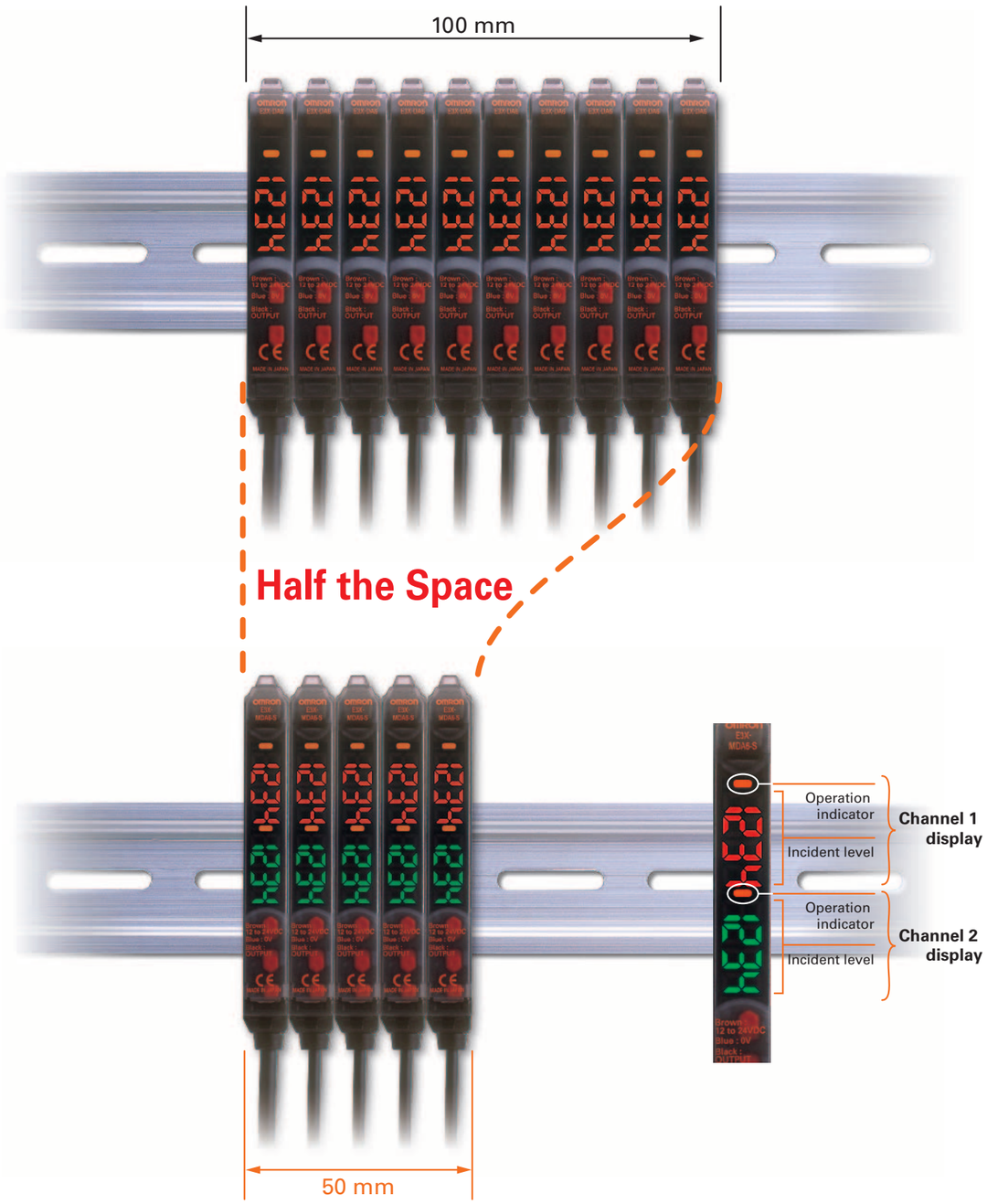
Bringing a new dimension to sensing…

…the 2-channel amplifier has arrived.

This document provides information mainly for selecting suitable models.
Please read the Instruction Sheet carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

realizing

Having problems gang-mounting Fiber Sensor Amplifier Units in tight spaces?

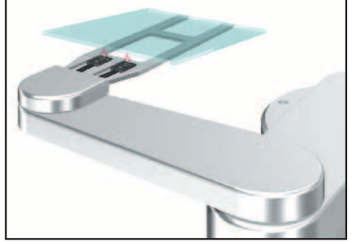


Smart Style!

Slimmest in the industry — 5 mm per channel. Patent pending

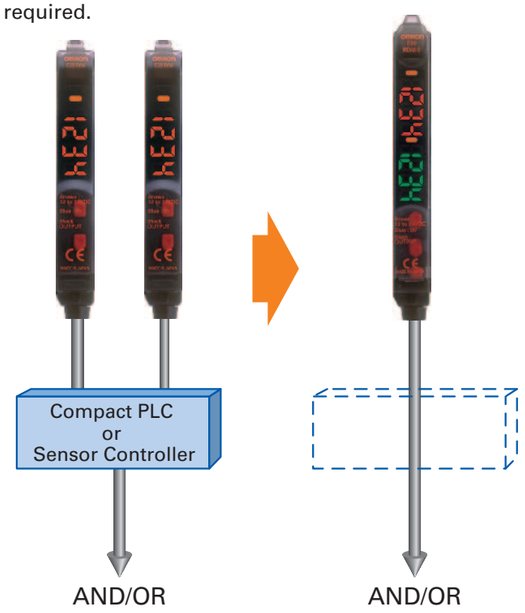
Two Amplifiers squeezed into a body of width 10 mm.
Remarkable space saving of approx. 50%.
Power saving of approx. 40%.
(Savings per channel compared with existing products.)

Checking alignment and mounting of LCD substrates

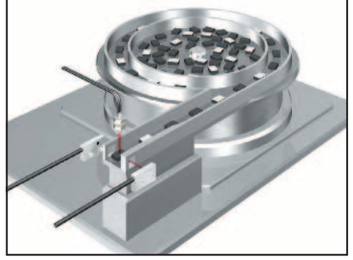


Equipped with AND/OR control output. Patent pending

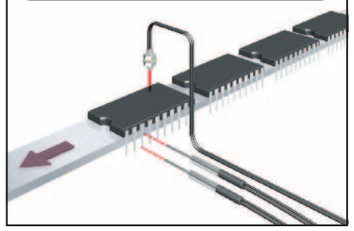
Two types of control output possible with one Sensor (AND/OR).
Compact PLCs and Sensor Controllers no longer required.



Detection and front/back discrimination of parts



Detection of bends in electronic component leads



Flexible control with Mobile Console.

The Mobile Console, which can also be used with the E3X-DA-S, allows handheld operation of the Fiber Head even when it is separated from the Amplifier.

An impressive lineup of Digital Amplifiers to handle a wide variety of applications.

The Digital Amplifiers achieve a maximum response time of 48 μs.

Standard Models

Models with Cables

(E3X-DA11-S)

Models with Connectors

Equipped with OMRON's own easy-wiring connector.

(E3X-DA6-S)

Advanced Models

Twin-output Models

Two threshold values can be set. Judgement and self-diagnosis output available.

(Representative model: E3X-DA6TW-S)

External-input Models

The Sensor can be controlled externally. Equipped with counting function.

(Representative model: E3X-DA6RM-S)

A wide variety of color variations available. Equipped with APC circuit for more stable detection.

Mark-detecting Models and Infrared Models

Models with Green LED

(Representative model: E3X-DAG6-S)

Models with Blue LED

(Representative model:E3X-DAB6-S)

Infrared Models Available Soon

(Representative model:E3X-DAH6-S)

NEW Two Amplifiers squeezed into a single, compact Unit. AND/OR output available.

2-channel Models

(Representative model:E3X-MDA6)

Maximize Fiber Amplifier potential using remote setting, copying, and other functionality.

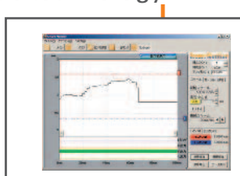
Mobile Console

(E3X-MC11-S)

A host of remarkable functions inside a compact body. A complete lineup of Sensor Heads to handle an even wider range of applications. This is the platform for OMRON's sensing technology.

Linear Platform

High-resolution sensing using laser and magnetic technology



Smart Monitor

Laser-type Smart Sensors **ZX-L Series**

An improved lineup for smarter sensing

Inductive Displacement Smart Sensors **ZX-E Series**

A lineup of Smart Sensors that use the eddy current method

ON/OFF Platform

A common platform for Fiber Sensors and Sensors with Separate Amplifiers

Mobile Console

Digital Fiber Sensors **E3X-DA-S/MDA Series**

Refinement and a new dimension that goes beyond superior performance.

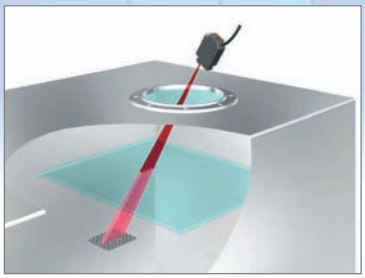
Laser-type Photoelectric Sensors with Separate Amplifiers **E3C-LDA Series**

Photoelectric Sensors with Separate Digital Amplifiers have joined the Smart Sensor family.

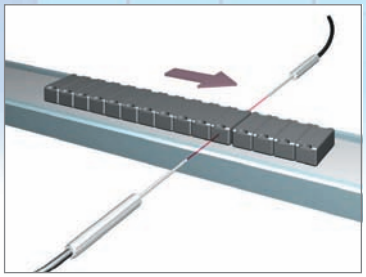
New Models That Counteract the Decline in Operating Rates Caused by Dust and Dirt

Advanced ATC Models

- **Active Threshold Control (ATC)**
  Automatically adjusts the threshold value.
- **ATC Error Output (Selectable Function)**
  Provides an error output when ATC does not adjust the threshold value.
- **Alarm Output (Selectable Function)**
  Provides an alarm when maintenance is required.



Glass substrate detection though view ports



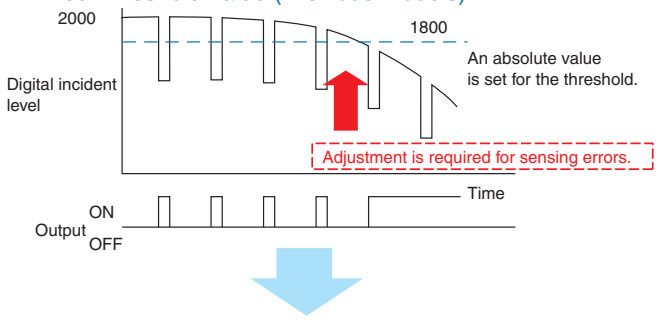
Chip component detection

Technology

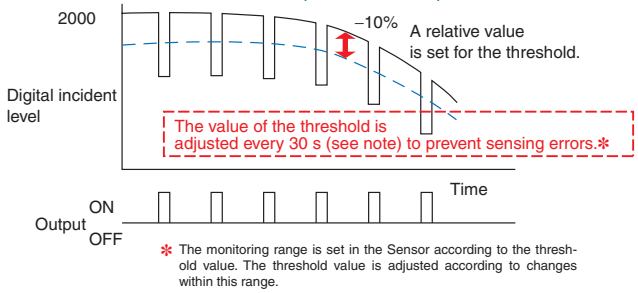
Intelligently Solve Problems Onsite with ATC Function

A unique OMRON algorithm has been used that can determine whether changes have been caused by dust and dirt or by differences in workpieces.
The threshold value is automatically adjusted by the Sensor according to changes to increase equipment operating rates by reducing sensing errors. This is particularly true in applications requiring high-precision detection.

Fixed Threshold Value (Previous Models)



Active Threshold Control (ATC Models)



* The monitoring range is set in the Sensor according to the threshold value. The threshold value is adjusted according to changes within this range.

The *DINC* Engine for High-performance Sensing

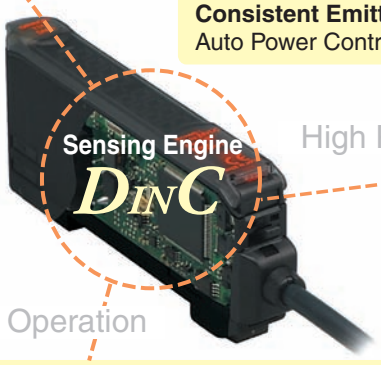
OMRON's many years of accumulated sensing technology and high-speed digital processing techniques merge to meet onsite needs. Our goal is high-performance sensing that provides easy, reliable application.

Reliable Detection of Small Workpieces
12-bit A/D converter (4,000 resolution), high-speed response of 48 µs (Fiber Sensors)

Fine Sensing

Automatic Compensation for External Changes
Active Threshold Control (ATC)

Consistent Emitter Power
Auto Power Control (APC)



High Performance

Easy Operation

Easy-to-read Displays Even at a Distance
Intelligent Display

Eliminates the Need for Distance Mode Settings
Power Tuning

Ordering Information

■ Digital Fiber Sensor

Type	Appearance	Functions	Model	
			NPN output	PNP output
Pre-wired Models		ATC ATC error output Alarm output	E3X-DA11AT-S	E3X-DA41AT-S
Connector Models			E3X-DA6AT-S	E3X-DA8AT-S

■ Separate Digital Amplifier Laser Sensors

Type	Appearance	Functions	Model	
			NPN output	PNP output
Pre-wired Models		ATC ATC error output Alarm output	E3C-LDA11AT	E3C-LDA41AT
Connector Models			E3C-LDA6AT	E3C-LDA8AT

Ratings and Specifications

Item	Model	Digital Fiber Sensors		Separate Digital Amplifier Laser Sensors	
Type	NPN output	E3X-DA11AT-S	E3X-DA6AT-S	E3C-LDA11AT	E3C-LDA6AT
	PNP output	E3X-DA41AT-S	E3X-DA8AT-S	E3C-LDA41AT	E3C-LDA8AT
Response time	Super-high-speed mode	Operate or Reset: 80 μs		Operate or Reset: 100 μs	
	High-speed mode	Operate or Reset: 250 μs		Operate or Reset: 250 μs	
	Standard mode	Operate or Reset: 1 ms			
	High-resolution mode	Operate or Reset: 4 ms			
Functions	ATC	Active threshold control (used for output 1)			
	I/O settings	The signal that is output can be selected (used for output 2): ATC error output			
	Startup operation	The operation when power is turned ON can be selected: No operation, PT, or PT + ATC			

Note: Basic performance is the same as the Advanced Twin-output Sensors. Refer to E3C-LDA Datasheet (E338) and E3X-DA-S Datasheet (E336) for details. Only differences from the Advanced Twin-output Sensors have been given above.

This document provides information mainly for selecting suitable models. Please read the *Instruction Sheet* carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

Note: Do not use this document to operate the Unit.

Note: Specifications subject to change without notice.

New Models That Eliminate Worries about Digital Sensor Setting Mistakes

Limited-function Models: Simple and Easy

Easy and Reliable Digital Sensors with the Same Detection Performance as Previous Models

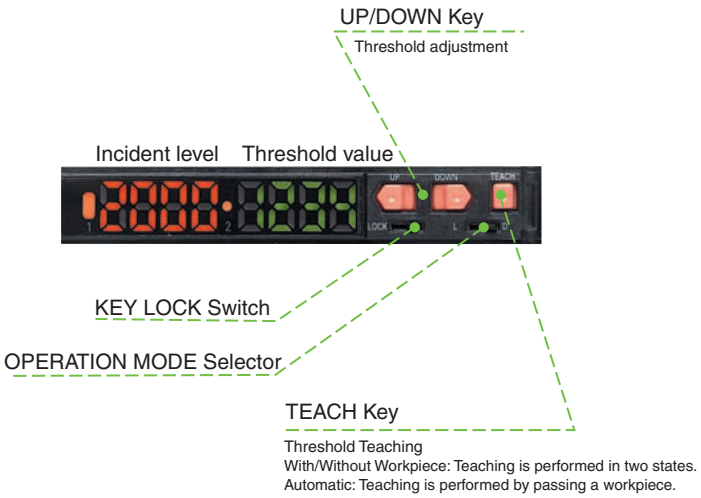
Digital Fiber Sensors
E3X-DA□SE-S

- One-key, one-operation concept for easy operation.
- Threshold value setting with direct operation performed while monitoring the detection status.
- Lock function to prevent operating errors through unintentional operation.

Technology

The Simplest Digital Fiber Sensor

Some people think that digital sensors with their advanced performance are difficult to use, so we went back to the drawing board to rethink performance and functions.
Without changing basic functions like APC and digital displays, OMRON created a Digital Fiber Sensor that can be used as easily as the familiar sensors with sensitivity adjustment knobs.



The *DINC* Engine for High-performance Sensing

OMRON's many years of accumulated sensing technology and high-speed digital processing techniques merge to meet onsite needs.
Our goal is high-performance sensing that provides easy, reliable application.

Ordering Information

Type	Appearance	Model	
		NPN output	PNP output
Pre-wired Models		E3X-DA11SE-S	E3X-DA41SE-S
Connector Models		E3X-DA6SE-S	E3X-DA8SE-S

Ratings and Specifications

Item	Type	Model	Digital Fiber Sensor	
		NPN output	E3X-DA11SE-S	E3X-DA6SE-S
		PNP output	E3X-DA41SE-S	E3X-DA8SE-S
Light source (wavelength)			Red LED (650 nm)	
Power supply voltage			12 to 24 VDC ±10%, ripple (p-p): 10% max.	
Power consumption			960 mW max. (Power supply: 24 V, Current consumption: 40 mA max.)	
Control output			Load power supply: 26.4 VDC max., Open-collector output, Load current: 50 mA max. (Residual voltage: 1 V max.)	
Protection circuits			Power supply reverse polarity protection, Output short-circuit protection	
Response time			Operate or Reset: 1 ms	
Sensitivity setting			Teaching or manual adjustment	
Functions	Auto power control		High-speed control method for emission current	
	Mutual interference prevention		Optical communications sync, possible for up to 10 Units	
Indicators			Operation indicator (orange)	
Digital displays			Twin digital displays (incident level + threshold)	

Note: Basic performance is the same as the E3X-DA-S Series. Refer to the E3X-DA-S Datasheet (E336) for details.

This document provides information mainly for selecting suitable models. Please read the *Instruction Sheet* carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

Note: Do not use this document to operate the Unit.

Note: Specifications subject to change without notice.

Digital Fiber Sensors

E3X-DA-S/MDA

OMRON's Next-generation Platform for a Wide Range of Detection

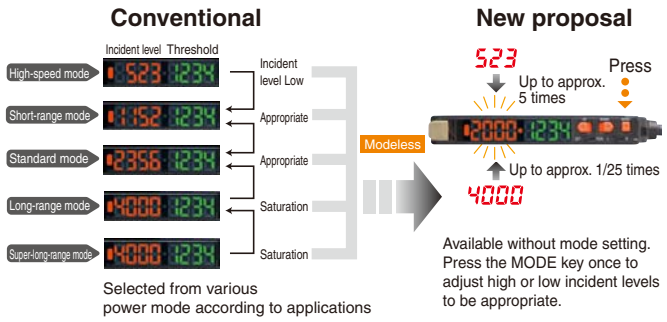
- Features a Power Tuning function that optimizes light reception at the press of a button.
- Combines newly developed 4-element LEDs with an APC circuit to ensure stable, long-term LED performance.
- Utilizes OMRON's innovative wire-saving connector.
- 2-channel models achieve the thinnest profile in the industry, at only 5 mm per channel.
- 2-channel models also offer AND/OR control output.

⚠ Be sure to read *Safety Precautions* on page 15.

Features

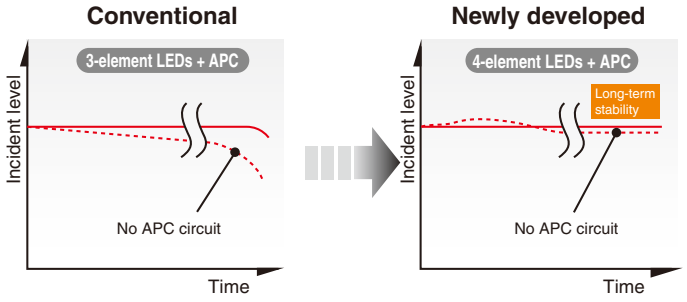
Equipped with an Industry's First Power Tuning (Optimum Light Setting) Function

The E3X-DA-S/MDA features a Power Tuning function that optimizes power at the press of a button.
This function easily but securely resolves saturation due to short sensing distances or insufficient incident light due to long sensing distances.
In addition, the response speed does not change as mode selection has tuned the power.



Adoption of Newly Developed 4-Element LEDs and an APC (Auto Power Control) Circuit Achieves Long-term Reliable Detection at the Highest Level in the Industry

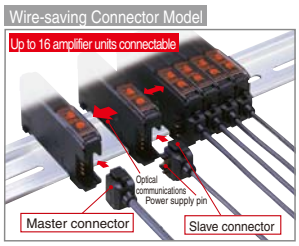
The long-term reliable detection at the highest level in the industry is achieved with the innovative APC circuit whose performance is proved by E3X-DA-N series and the newly developed high-power LEDs (4-element type) to ensure super stable, long-term LED performance.
Stable performance is always available without the ON/OFF setting of an APC circuit.

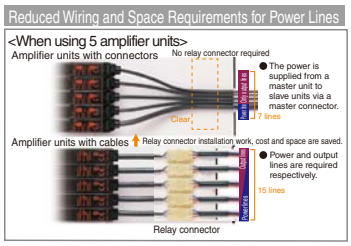


OMRON's Innovative Wire-saving Connector Inherited from the E3X-DA-N

The amplifier units with connectors supply the power to slave connectors via a master connector. This offers three following advantages.

1. Greatly reduced wiring work
2. Improved space usability due to the unnecessity of relay connectors
3. Simple stock management due to the unnecessity of distinction between master and slave for amplifiers

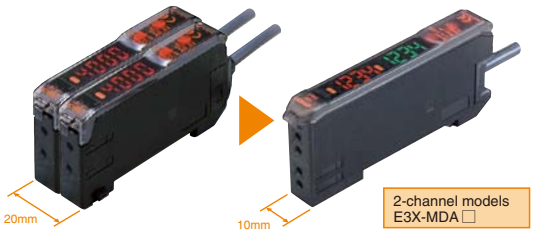




Models available for a wide variety of applications at manufacturing sites

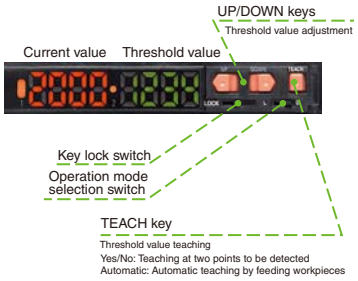
Industry Leading Two Amplifiers Loaded in a Small Body ···· 2-channel models

Two amplifiers are loaded in a 10 mm-wide body.
Space usability can be approximately doubled.
In addition, approximately 40% of the energy can be saved.
(compared to the value per channel of the former model)



Simpler Digital Fiber Sensors ···· Simple & Easy Single-function Models

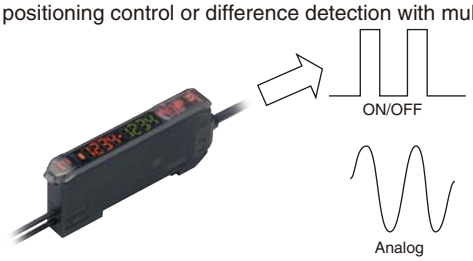
Required performance and functions have been reviewed from basic points to improve high-performance but hard-to-use digital models. Digital fiber sensors, used in the sense as if using volume type sensors, are added to the basic functions such as an APC function and digital display.



High-speed and High-resolution Analog Output Supports Wide Variety of Applications ···· Advanced Analog Output Models

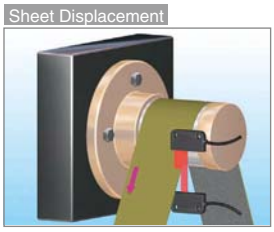
Analog Control Output

The voltage in the range of 1 to 5 V is output according to the incident level (digital display). Wide variety of applications is possible including positioning control or difference detection with multiple levels.



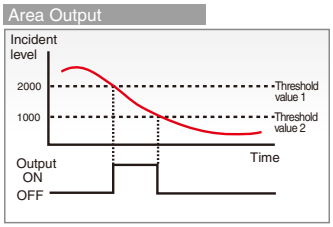
High-speed and High Resolution

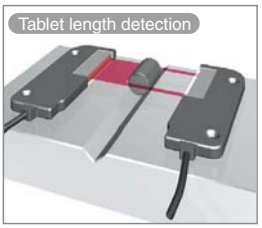
Detection modes can be switched in accordance with applications. High-speed response of 80 μs (super-high-speed mode) supports the positioning controls that require high-speed control.



Area Output Function Area Judgment Is Possible ···· Advanced, Twin-output Models

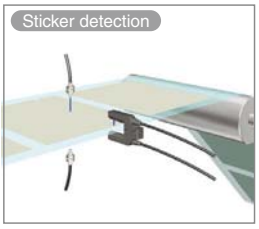
Only one sensor is enough for area judgment for height or others that has required multiple sensors.
Setting two threshold values allows easy output inside and outside range.





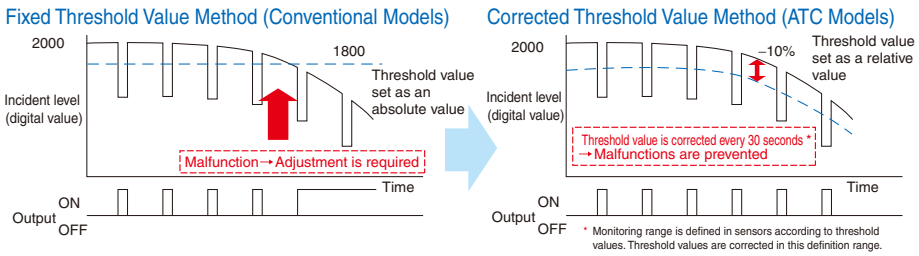
Remote Input Function Sensors Controlled from Outside ···· Advanced, External-input Models

Remote settings for teaching/power tuning/light OFF are possible with input signals.
The remote input function meets the diversifying demands such as remote settings made for frequent teaching due to level change corresponding to workpiece change or remote operation check of sensors before operation.



Equipped with an Industry's First ATC Function that Resolves Problems at Manufacturing Sites ···· Advanced ATC Models

OMRON's unique algorism is equipped to distinguish dust or dirt and the change of workpieces. Automatic correction of threshold values by sensors in accordance with changes prevents malfunctions and improves the operating rates of machines. The ATC function is especially effective for the applications that require high-resolution detection.



Ordering Information

Amplifier Units

Amplifier Units with Cables

Item		Appearance	Functions	Model	
				NPN output	PNP output
Single-function models			---	E3X-DA11SE-S	E3X-DA41SE-S
Standard models			Timer, Response speed change	E3X-DA11-S	E3X-DA41-S
Mark-detecting models (multiple color light sources)	Green LED			E3X-DAG11-S	E3X-DAG41-S
	Blue LED			E3X-DAB11-S	E3X-DAB41-S
	Infrared LED			E3X-DAH11-S	E3X-DAH41-S
Advanced models	External-input models		Remote setting, counter, differential operation	E3X-DA11RM-S	E3X-DA41RM-S
	Twin-output models		Area output, self-diagnosis, differential operation	E3X-DA11TW-S	E3X-DA41TW-S
	ATC function models		ATC (Threshold value automatic correction)	E3X-DA11AT-S	E3X-DA41AT-S
	Analog output models		Analog output models	E3X-DA11AN-S	E3X-DA41AN-S
2-channel models			AND/OR output	E3X-MDA11	E3X-MDA41

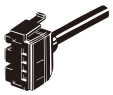
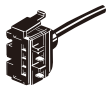
Amplifier Units with Connectors

Item		Appearance	Functions	Model	
				NPN output	PNP output
Single-function models			---	E3X-DA6SE-S	E3X-DA8SE-S
Standard models			Timer, Response speed change	E3X-DA6-S	E3X-DA8-S
Mark-detecting models (multiple color light sources)	Green LED			E3X-DAG6-S	E3X-DAG8-S
	Blue LED			E3X-DAB6-S	E3X-DAB8-S
	Infrared LED			E3X-DAH6-S	E3X-DAH8-S
Advanced models	External-input models		Remote setting, counter, differential operation	E3X-DA6RM-S	E3X-DA8RM-S
	Twin-output models		Area output, self-diagnosis, differential operation	E3X-DA6TW-S	E3X-DA8TW-S
	ATC function models		ATC (Threshold value automatic correction)	E3X-DA6AT-S	E3X-DA8AT-S
2-channel models			AND/OR output	E3X-MDA6	E3X-MDA8

Ratings and Specifications

		Light source	Response time	Control output/input			Functions					
				ON/OFF output	Input	Analog output	Power tuning	Timer	Interference prevention	Differential detection	counter	ATC
Single-function models		Red LED	1ms	Only main	---	---	---	---	○	---	---	---
Standard models			50µs to 4ms				○	○				
Mark-detecting models	E3X-DA□G-S	Green LED	50µs to 4ms	Only main	---	---	○	○	○	---	---	---
	3X-DA□B-S	Blue LED										
	E3X-DA□H-S	Infrared LED										
Advanced models	Twin-output models	Red LED	50µs to 4ms	Only main	○ (1 line)	---	○	○	○	○	○	---
	External-input models		80µs to 4ms	Main + sub (2 lines)	---						---	
	ATC function models		130µs to 4ms									○
	Analog output		80µs to 4ms	Only main		○ (1 line)				---		---
2-channel models		Red LED	130µs to 4ms	Main + main (2 independent lines)	---	---	○	○	○	---	---	---

Amplifier Unit Connectors (Order Separately)

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

Combining Amplifier Units and Connectors

Amplifier Units and Connectors are sold separately. Refer to the following tables when placing an order.

Amplifier Unit				Applicable Connector (Order Separately)	
Model	NPN output	PNP output		Master Connector	Slave Connector
Single-function models	E3X-DA6SE-S	E3X-DA8SE-S	+	E3X-CN11	E3X-CN12
Standard models	E3X-DA6-S	E3X-DA8-S			
Mark-detecting models (multiple color light sources)	E3X-DAG6-S	E3X-DAG8-S			
	E3X-DAB6-S	E3X-DAB8-S			
	E3X-DAH6-S	E3X-DAH8-S			
Advanced models	E3X-DA6TW-S	E3X-DA8TW-S		E3X-CN21	E3X-CN22
	E3X-DA6RM-S	E3X-DA8RM-S			
	E3X-DA6AT-S	E3X-DA8AT-S			
2-channel models	E3X-MDA6	E3X-MDA8			

When Using 5 Amplifier Units

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

Mobile Console (Order Separately)

Appearance	Model	Remarks
	**E3X-MC11-SV2** (model number of set)	Mobile Console with Head, Cable, and AC adapter provided as accessories
	**E3X-MC11-C1-SV2**	Mobile Console
	**E3X-MC11-H1**	Head
	**E39-Z12-1**	Cable (1.5 m)

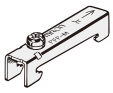
Note: Use the E3X-MC11-SV2 Mobile Console for the E3X-DA-S/MDA-series Amplifier Units.
The E3X-MC11-SV2 is an upgraded version of the E3X-MC11-S that is fully interchangeable with the older model.

Accessories (Order Separately)

Mounting Bracket

Appearance	Model	Quantity
	**E39-L143**	1

End Plate

Appearance	Model	Quantity
	**PFP-M**	1

Ratings and Specifications

Refer to pages 17 to 20 for dimensions.

Amplifier Units

Item \ Type		Single-function models	Standard models	Mark-detecting models (multiple color light sources)		
				Green LED	Blue LED	Infrared LED
Item	Model	E3X-DA□SE-S	E3X-DA□-S	E3X-DAG□-S	E3X-DAB□-S	E3X-DAH□-S
Light source (wavelength)		Red LED (635 nm)		Green LED (525 nm)	Blue LED (470 nm)	Infrared LED (870nm)
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) 10% max.				
Power consumption		960 mW max. (current consumption: 40 mA max. at power supply voltage of 24 VDC)				
Control output		Load power supply voltage: 26.4 VDC; NPN/PNP open collector; load current: 50 mA max.; residual voltage: 1 V max.				
Protection circuits		Reverse polarity for power supply connection, output short-circuit				
Response time	Super-high-speed mode	---	Operate: 48 μs, reset: 50 μs *1, *2			
	High-speed mode	---	Operate/reset: 250 μs			
	Standard mode	Operate or reset: 1 ms				
	High-resolution mode	---	Operate or reset: 4 ms			
Sensitivity setting		Teaching or manual method				
Functions	Power tuning	---	Light emission power and reception gain, digital control method			
	Timer function	---	Select from OFF-delay, ON-delay, or one-shot timer. 1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 10-ms increments, 200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments)			
	Automatic power control (APC)	High-speed control method for emission current				
	Zero-reset	---	Negative values can be displayed. (Threshold value is shifted.)			
	Initial reset	Settings can be returned to defaults as required.				
	Mutual interference prevention	Possible for up to 10 Units *3				
Display		Operation indicator (orange)	Operation indicator (orange), Power Tuning indicator (orange)			
Digital display		incident level + threshold	Select from incident level + threshold or other 6 patterns			
Display orientation		---	Switching between normal/reversed display is possible.			
Ambient illumination (Receiver side)		Incandescent lamp: 10,000 lux max. Sunlight: 20,000 lux max.				
Ambient temperature range		Operating: Groups of 1 to 2 Amplifiers: −25°C to 55°C Groups of 3 to 10 Amplifiers: −25°C to 50°C Groups of 11 to 16 Amplifiers: −25°C to 45°C Storage: −30°C to 70°C (with no icing or condensation)				
Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)				
Insulation resistance		20 MΩ min. (at 500 VDC)				
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute				
Vibration resistance		Destruction: 10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions				
Shock resistance		Destruction: 500 m/s^2, for 3 times each in X, Y and Z directions				
Degree of protection		IEC 60529 IP50 (with Protective Cover attached)				
Connection method		Pre-wired or amplifier unit connector				
Weight (packed state)		Pre-wired model: Approx. 100 g, Amplifier unit connector model: Approx. 55 g				
Materials	Case	Polybutylene terephthalate (PBT)				
	Cover	Polycarbonate (PC)				
Accessories		Instruction manual				

*1. Communications are disabled if the detection mode is selected during super-high-speed mode, and the communications functions for mutual interference prevention and the Mobile Console will not function.
*2. PNP output is as follows: Operate: 53 μs, reset: 55 μs.
*3. Mutual interference prevention can be used for only up to 6 Units if power tuning is enabled.

Item	Model	Advanced models: External input models	Advanced models: Twin output models	Advanced models: ATC function models	Advanced models: Analog output models	2-channel models
		E3X-DA□RM-S	E3X-DA□TW-S	E3X-DA□AT-S	E3X-DA□AN-S	E3X-MDA□
Light source (wavelength)		Red LED (635 nm)				
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) 10% max.				
Power consumption		1,080mW max. (current consumption: 45 mA max. at power supply voltage of 24 VDC)				
Control output	ON/OFF output	Load power supply voltage: 26.4 VDC; NPN/PNP open collector; load current: 50 mA max.; residual voltage: 1 V max.				
Control output	Analog output	---			**Control output** Voltage output: 1 to 5 VDC (Connection load 10 kΩ min.) **Temperature characteristics** 0.3%F.S./°C **Response speed/repeat accuracy** Super-high-speed mode: 80 μs/1.5%F.S. High-speed mode: 250 μs/1.5%F.S. Standard mode: 1 ms/1%F.S. High-resolution mode: 4 ms/0.75%F.S.	---
Protection circuits		Reverse polarity for power supply connection, output short-circuit				
Response time	Super-high-speed mode	Operate: 48 μs, reset: 50 μs *1, *2, *3	Operate or reset: 80 μs *1	Operate or reset: 130 μs *1	Operate or reset: 80 μs *1	Operate or reset: 130 μs *1, *4
Response time	High-speed mode	Operate or reset: 250 μs				Operate or reset: 450 μs
Response time	Standard mode	Operate or reset: 1ms				
Response time	High-resolution mode	Operate or reset: 4ms				
Sensitivity setting		Teaching or manual method				
Functions	Power tuning	Light emission power and reception gain, digital control method				
Functions	Differential detection	Switchable between single edge and double edge detection mode Single edge: Can be set to 250 μs, 500 μs, 1 ms, 10 ms, or 100 ms. Double edge: Can be set to 500 μs, 1 ms, 2 ms, 20 ms, or 200 ms.			---	
Functions	Timer function	Select from OFF-delay, ON-delay, or one-shot timer.				
		1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 10-ms increments, 200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments)				
Functions	Automatic power control (APC)	High-speed control method for emission current				
Functions	Zero-reset	Negative values can be displayed. (Threshold value is shifted.)				
Functions	Initial reset	Settings can be returned to defaults as required.				
Functions	Mutual interference prevention	Possible for up to 10 Units *5				Possible for up to 9 Units (18 channels) *6
Functions	Counter	Switchable between up counter and down counter. Set count: 0 to 9,999,999	---			
Functions	I/O setting	External input setting (Select from teaching, power tuning, zero reset, light OFF, or counter reset.)	Output setting (Select from channel 2 output, area output, or self-diagnosis.)	Output setting (Select from channel 2 output, area output, self-diagnosis output, or ATC error output)	Analog output setting (offset voltage adjustable)	Output setting (Select from channel 2 output, AND, OR, leading edge sync, falling edge sync, or differential output)
Display		Operation indicator (orange), Power Tuning indicator (orange)	Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange)		Operation indicator (orange), Power Tuning indicator (orange)	Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange)

*1. Communications are disabled if the detection mode is selected during super-high-speed mode, and the communications functions for mutual interference prevention and the Mobile Console will not function.
*2. PNP output is as follows: Operate: 53 μs, reset: 55 μs.
*3. When counter is enabled: 80 μs for operate and reset respectively.
*4. When differential output is selected for the output setting, the second channel output is 200 μs for operation and reset respectively.
*5. Mutual interference prevention can be used for only up to 6 Units if power tuning is enabled.
*6. Mutual interference prevention can be used for up to 5 Units (10 channels) if power tuning is enabled.

Item \ Type	Advanced models				2-channe models
	External input models	Twin-output models	ATC function models	Analog output models	
Model	E3X-DA□RM-S	E3X-DA□TW-S	E3X-DA□AT-S	E3X-DA□AN-S	E3X-MDA□
Digital display	Select from incident level + threshold or other 7 patterns	Select from incident level + threshold or other 6 patterns			Select from incident level for channel 1 + incident level for channel 2 or other 7 patterns
Display orientation	Switching between normal/reversed display is possible.				
Ambient illumination (Receiver side)	Incandescent lamp: 10,000 lux max. Sunlight: 20,000 lux max.				
Ambient temperature range	Operating: Groups of 1 to 2 Amplifiers: –25°C to 55°C Groups of 3 to 10 Amplifiers: –25°C to 50°C Groups of 11 to 16 Amplifiers: –25°C to 45°C				
	Storage: –30°C to 70°C (with no icing or condensation)				
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)				
Insulation resistance	20 MΩ min. (at 500 VDC)				
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute				
Vibration resistance	Destruction: 10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions				
Shock resistance	Destruction: 500 m/s^2, for 3 times each in X, Y and Z directions				
Degree of protection	IEC 60529 IP50 (with Protective Cover attached)				
Connection method	Pre-wired or amplifier unit connector				
Weight (packed state)	Pre-wired model: Approx. 100 g, Amplifier unit connector model: Approx. 55 g				
Materials: Case	Polybutylene terephthalate (PBT)				
Materials: Cover	Polycarbonate (PC)				
Accessories	Instruction manual				

Amplifier Unit Connectors

Item \ Model		E3X-CN11/21/22	E3X-CN12
Rated current		2.5 A	
Rated voltage		50 V	
Contact resistance		20 mΩ max. (20 mVDC max., 100 mA max.) (The figure is for connection to the Amplifier Unit and the adjacent Connector. It does not include the conductor resistance of the cable.)	
No. of insertions		Destruction: 50 times (The figure for the number of insertions is for connection to the Amplifier Unit and the adjacent Connector.)	
Materials	Housing	Polybutylene terephthalate (PBT)	
	Contacts	Phosphor bronze/gold-plated nickel	
Weight (packed state)		Approx. 55 g	Approx. 25 g

Mobile Console

Item \ Model	E3X-MC11-SV2
Applicable Sensors	E3X-DA-S E3X-MDA E3C-LDA E2C-EDA
Power supply voltage	Charged with AC adapter
Connection method	Connected via adapter
Weight (packed state)	Approx. 580 g (Console only: 120 g)

Refer to *Instruction Manual* provided with the Mobile Console for details.

Sensing Distance

Through-beam Models

(Unit: mm)

Type		Model	E3X-DA□-S				E3X-MDA□			
			High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode	High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode
Standard models	Flexible (new standard)	E32-T11R/E32-T12R/E32-T15XR/ E32-TC200BR(B4R)	700	530	350	140	450	350	230	140
		E32-T14LR/E32-T15YR/E32-T15ZR	270	210	130	50	170	130	85	50
		E32-T21R/E32-T22R/E32-T222R/ E32-T25XR/E32-TC200FR(F4R)	160	130	75	30	100	75	50	30
		E32-T24R/E32-T25YR/E32-T25ZR	60	50	25	10	35	27	18	10
	Standard	E32-TC200/E32-T12/E32-T15X/ E32-TC200B(B4)	1,000	760	500	200	650	500	330	200
		E32-T14L/E32-T15Y/E32-T15Z	600	460	300	120	390	300	200	120
		E32-TC200A	900	680	450	180	580	450	300	180
		E32-TC200E/E32-T22/E32-T222/ E32-T25X/E32-TC200F(F4)	270	220	125	50	170	130	85	50
		E32-T24/E32-T25Y/E32-T25Z	160	130	75	30	100	70	45	30
	Break-resistant	E32-T11/E32-T12B/E32-T15XB	900	680	450	180	580	450	300	180
		E32-T21/E32-T221B/E32-T22B	240	200	110	45	150	110	70	45
		E32-T25XB	180	150	85	35	125	95	60	35
	Fluorine coating	E32-T11U	900	680	450	180	580	450	300	180
Special-beam models	Long-distance, high power	E32-T17L	20,000*1	20,000*1	10,000	4,000	13,000	10,000	6,500	4,000
		E32-TC200 + E39-F1	4,000*2	4,000*2	2,600	1,500	4,000	3,700	2,400	1,500
		E32-T11R + E39-F1	4,000*2	3,700	2,400	970	3,100	2,400	1,600	970
		E32-T11 + E39-F1	4,000*2	3,600	2,300	930	3,000	2,300	1,500	930
		E32-T14	4,000*2	3,400	2,250	900	2,900	2,200	1,450	900
		E32-T11L/E32-T12L	1,700	1,330	870	350	1,100	870	580	350
		E32-T11L + E39-F2	910	800	500	180	600	520	340	180
		E32-T11R + E39-F2	520	400	250	100	330	260	170	100
		E32-T11 + E39-F2	820	660	430	160	530	430	280	160
		E32-T21L/E32-T22L	540	440	250	100	340	260	170	100
	Ultracompact, ultrafine sleeve	E32-T223R	160	130	75	30	110	85	55	30
		E32-T33-S5	53	44	25	10	35	28	18	10
		E32-T333-S5	12	10	6	4	8	6	5	4
		E32-T334-S5	6	5	3	2	4	3	2	2
	Fine beam	E32-T22S	2,500	1,900	1,250	500	1,600	1,250	830	500
		E32-T24S	1,750	1,300	870	350	1,100	870	580	350
	Area sensing	E32-T16PR	1,100	840	560	220	730	560	370	220
		E32-T16P	1,500	1,100	750	300	970	750	500	300
		E32-T16JR	980	750	480	190	600	480	320	190
		E32-T16J	1,300	1,000	650	260	800	650	430	260
		E32-T16WR	1,700	1,300	850	340	1,100	860	570	340
		E32-T16W	2,300	1,800	1,150	450	1,400	1,100	730	450
		E32-T16	3,700	2,800	1,850	740	2,400	1,800	1,200	740
		E32-M21	750	610	350	140	470	360	240	140

*1. The optical fiber for the E32-T17L is 10 m long on each side, so the value is 20,000 mm
*2. The optical fiber is 2 m long on each side, so the sensing distance is 4,000 mm.

Type		Model	E3X-DA□-S				E3X-MDA□			
			High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode	High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode
Environment resistive models	Heat-resistant	E32-T51	1,000	760	500	200	650	500	330	200
		E32-T54	300	230	150	60	190	150	100	60
		E32-T81R-S	360	280	180	70	230	180	120	70
		E32-T61-S + E39-F2	600	450	300	120	390	300	200	120
		E32-T61-S + E39-F1	4,000	3,400	2,200	900	3,000	2,200	1,450	900
		E32-T84S-S	1,750	1,300	870	350	1,100	870	570	350
		E32-T61-S	600	450	300	120	390	300	200	120
	Chemical resistant	E32-T11F	2,500	2,000	1,300	520	1,600	1,300	850	520
		E32-T12F	4,000*	3,000	2,000	800	2,600	2,000	1,300	800
		E32-T14F	500	400	250	100	320	250	160	100
		E32-T51F	1,800	1,400	900	350	1,190	920	600	350
		E32-T81F-S	920	700	460	190	600	460	300	190
	Vacuum resistant	E32-T51V	260	200	130	50	170	130	85	50
		E32-T51V + E39-F1V	1,350	1,000	680	260	850	650	430	260
		E32-T54V	210	130	100	35	110	85	55	35
		E32-T54V + E39-F1V	660	500	330	180	420	320	210	180
		E32-T84SV	630	480	320	130	410	310	200	130

* The optical fiber for the E32-T12F is 2 m long on each side, so the sensing distance is 4,000 mm.

Reflective Models

(Unit: mm)

Type		Model	E3X-DA□-S				E3X-MDA□			
			High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode	High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode
Standard models	Flexible (new standard)	E32-D11R/E32-D12R/E32-D15XR/ E32-DC200BR(B4R)	300	170	120	50	170	120	80	50
		E32-D14LR	80	45	30	14	45	33	22	14
		E32-D15YR/E32-D15ZR	70	40	26	12	40	29	19	12
		E32-D211R/E32-D21R/E32-D22R/ E32-D25XR/E32-DC200FR(F4R)	50	30	20	8	30	22	14	8
		E32-D24R	26	15	10	4	15	10	6	4
		E32-D25YR/E32-D25ZR	14	8	5	2	8	5	3.3	2
	Standard	E32-DC200/E32-D15X/ E32-DC200B(B4)	500	300	200	90	300	210	130	90
		E32-D12	400	230	160	70	230	160	100	70
		E32-D14L	200	110	80	36	110	80	50	36
		E32-D15Y/E32-D15Z	170	100	65	30	100	70	45	30
		E32-D211/E32-DC200E/E32-D22/ E32-D25X/E32-DC200F(F4)	130	80	50	22	80	55	35	22
		E32-D24	50	30	20	8	30	22	14	8
		E32-D25Y/E32-D25Z	35	20	12	6	20	14	9	6
	Break-resistant	E32-D11/E32-D15XB	300	170	120	50	170	125	80	50
		E32-D21B/E32-D221B	110	70	45	20	70	50	30	20
		E32-D21/E32-D22B	50	30	20	8	30	22	14	8
		E32-D25XB	85	50	30	15	50	35	23	15
	Fluorine coating	E32-D11U	300	170	120	50	170	125	80	50

Type		Model	E3X-DA□-S				E3X-MDA□			
			High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode	High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode
Special-beam models	Long distance, high power	E32-D16	40 to 1,000	40 to 700	40 to 450	40 to 240	40 to 600	40 to 490	40 to 300	40 to 240
		E32-D11L	650	400	260	110	400	270	180	110
		E32-D21L/E32-D22L	210	130	80	35	130	85	55	35
	Ultracompact, ultrafine sleeve	E32-D33	25	16	10	4	16	10	6	4
		E32-D331	5	3	2	0.8	3	2	1.3	0.8
	Coaxial/small spot	E32-CC200R	250	150	100	45	150	105	65	45
		E32-CC200	500	300	200	90	300	210	140	90
		E32-D32L	250	150	100	45	150	100	65	45
		E32-C31/E32-D32	120	75	50	22	75	50	30	22
		E32-C42 + E39-F3A	Spot diameter variable in the range 0.1 to 0.6 mm at distances in the range 6 to 15 mm.							
		E32-D32 + E39-F3A	Spot diameter variable in the range 0.5 to 1mm at distances in the range 6 to 15 mm.							
		E32-C41 + E39-F3A-5	0.1-mm dia. spot at a distance of 7 mm.							
		E32-C31 + E39-F3A-5	0.5-mm dia. spot at a distance of 7 mm.							
		E32-C41 + E39-F3B	0.2-mm dia. spot at a distance of 17 mm.							
		E32-C31 + E39-F3B	0.5-mm dia. spot at a distance of 17 mm.							
		E32-C31 + E39-F3C	Spot diameter of 4 mm max. at distances in the range 0 to 20 mm.							
	Area sensing	E32-D36P1	250	150	100	45	150	100	65	45
	Retroireflective	E32-R21 + E39-R3 (provided)	10 to 250							
		E32-R16 + E39-R1 (provided)	150 to 1,500							
	Convergent-reflective	E32-L25/E32-L25A	3.3							
		E32-L24S	0 to 4							
		E32-L24L	2 to 6 (center 4)							
		E32-L25L	5.4 to 9 (center 7.2)							
		E32-L86	4 to 10							
		E32-L16	0 to 15			0 to 12	0 to 15			0 to 12
Environment-resistive models	Heat-resistant	E32-D51	400	230	160	72	230	165	110	72
		E32-D81R-S E32-D61-S	150	90	60	27	90	63	40	27
		E32-D73-S	100	60	40	18	60	40	25	18
	Chemical-resistant	E32-D12F	160	95	65	30	95	70	45	30
		E32-D14F	70	40	30	10	40	28	18	10

Application-specific Models

(Unit: mm)

Type		Model	E3X-DA□-S				E3X-MDA□			
			High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode	High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode
Application-specific models	Label detection	E32-G14	10							
		E32-T14	4,000*	3,400	2,250	900	2,900	2,200	1,450	900
	Liquid-level detection	E32-L25T	Applicable tube: Transparent tube with a diameter in the range 8 to 10 mm and a recommended wall thickness of 1 mm							
		E32-D36T	Applicable tube: Transparent tube (no restriction on diameter)							
		E32-A01	Applicable tube: Transparent tube with a diameter of 3.2, 6.4, or 9.5 mm and a recommended wall thickness of 1 mm							
		E32-A02	Applicable tube: Transparent tube with a diameter in the range 6 to 13 mm and a recommended wall thickness of 1 mm							
		E32-D82F1(F2)	Liquid-contact model							
	Glass-substrate alignment	E32-L16	0 to 15			0 to 12	0 to 15			0 to 12
		E32-A08	10 to 20			---	10 to 20			---
		E32-A07E1(E2)	15 to 25			---	15 to 25			---
		E32-L66	5 to 18		5 to 16	---	5 to 18		5 to 14	---
	Glass-substrate Mapping	E32-A09/E32-A09H	15 to 38			---	15 to 38			---
		E32-A09H2	20 to 30			---	20 to 30			---
	Wafer mapping	E32-A03/E32-A03-1	1,150	890	600	250	750	580	380	250
		E32-T24S	1,750	1,300	870	350	1,100	870	580	350
		E32-A04/E32-A04-1	460	340	225	100	300	220	145	100

* The optical fiber for the E32-T14 is 2 m long on each side, so the sensing distance is 4,000 mm.

Green, Blue, and Infrared Light Sources

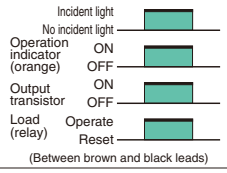
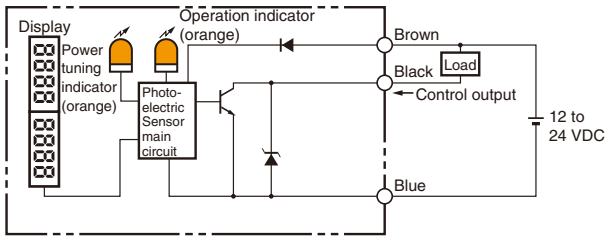
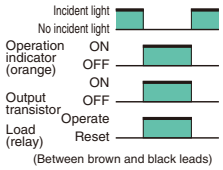
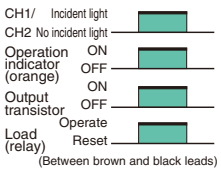
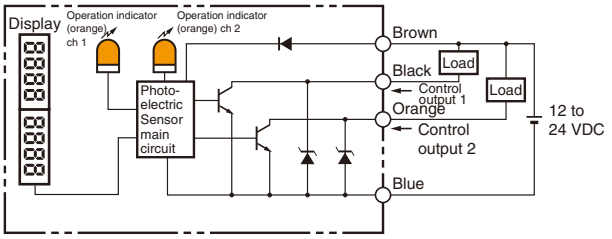
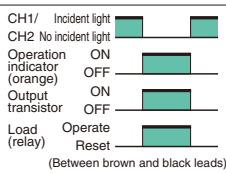
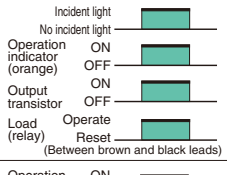
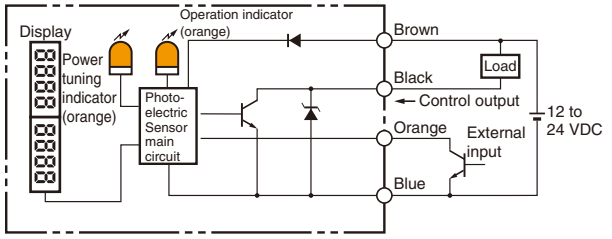
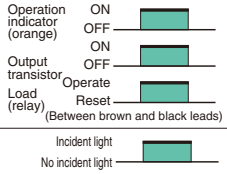
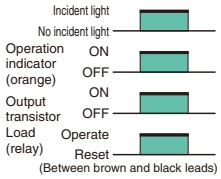
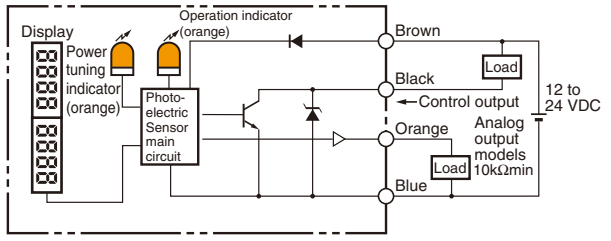
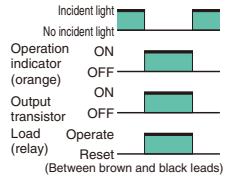
(Unit: mm)

Type		Model	E3X-DAG□-S/DAB□-S				E3X-DAH□-S			
			High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode	High-resolution mode	Standard mode	High-speed mode	Super-high-speed mode
Through-beam models	Standard	E32-T11R/E32-T12R/E32-T15XR/ E32-TC200BR(B4R)	65	50	35	30	280	190	130	55
		E32-T14LR/E32-T15YR/ E32-T15ZR	25	20	22	12	100	75	80	21
		E32-TC200/E32-T12/E32-T15X/ E32-TC200B(B4)	100	75	50	45	400	280	180	80
		E32-T14L/E32-T15Y/E32-T15Z	50	40	30	25	240	160	110	45
	Special beam	E32-T11L/E32-T12L	150	120	85	75	700	490	320	140
Reflective models	Standard	E32-D11R/E32-D12R/E32-D15XR/ E32-DC200BR(B4R)	17	14	10	8	120	90	60	21
		E32-D14LR	4.4	3.5	2.5	2.2	32	24	16	5.5
		E32-D15YR/E32-D15ZR	4.2	3.3	2.2	2.1	28	20	13	5
		E32-DC200/E32-D15X/ E32-DC200B(B4)	32	25	16	16	200	150	100	35
		E32-D14L	11	9	6	5.5	80	60	40	14
		E32-D15Y/E32-D15Z	10	8	5.5	5	65	50	33	11
	Special beam	E32-D11L	44	35	22	22	260	190	130	45
		E32-CC200R	15	12	8	7.5	100	75	50	17
		E32-CC200	32	25	16	16	200	150	100	35
		E32-D32L	15	12	8	7.5	100	75	50	17
		E32-C31/E32-D32	7.5	6	4	3.5	50	37	25	8.5
Application-specific models	Label detection	E32-T14	320	260	220	160	1,800	1,200	820	360
		E32-G14	10				10			

Refer to *E32 Series* for details on Fiber Units.

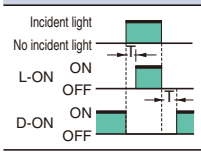
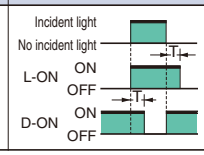
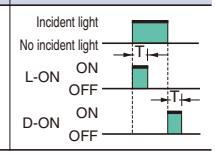
Output Circuit Diagrams

NPN Output

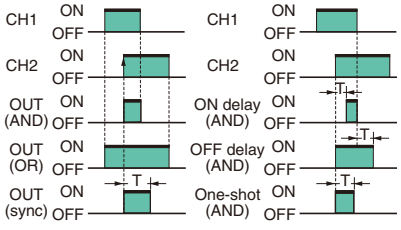
Model	Operation mode	Timing charts	Operation selector	Output circuit
E3X-DA11-S E3X-DA6-S E3X-DAG11-S E3X-DAG6-S E3X-DAB11-S E3X-DAB6-S E3X-DA11SE-S E3X-DA6SE-S	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	
E3X-DA11TW-S E3X-DA6TW-S E3X-MDA11 E3X-MDA6 E3X-DA11AT-S E3X-DA6AT-S	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	
E3X-DA11RM-S E3X-DA6RM-S	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	
E3X-DA11AN-S	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	

Note: 1. The ON/OFF regions when areas settings are used with the E3X-DA□TW-S are as follows:
LIGHT ON: ON when the incident level is between the thresholds for channels 1 and 2.
DARK ON: OFF when the incident level is between the thresholds for channels 1 and 2.

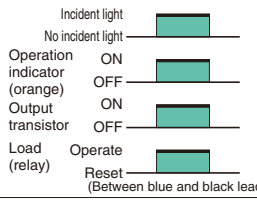
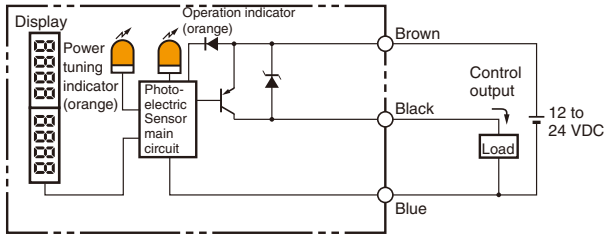
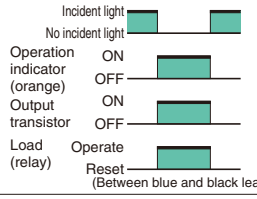
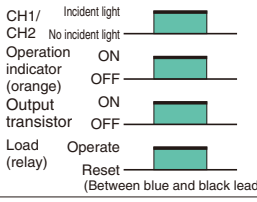
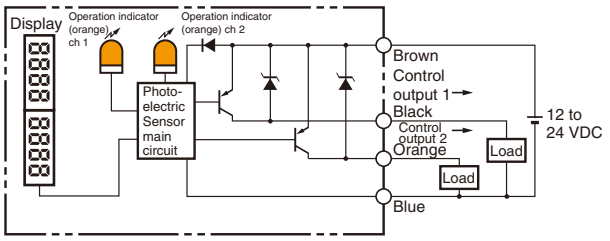
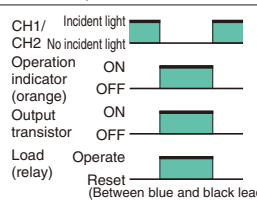
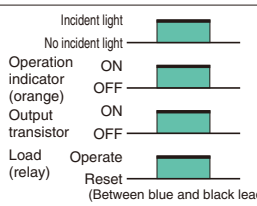
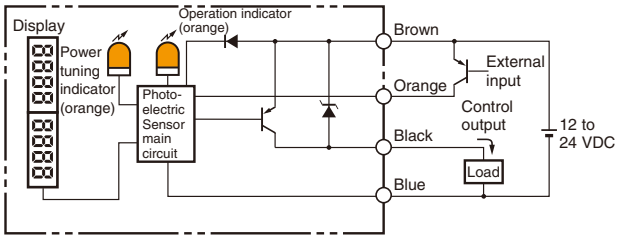
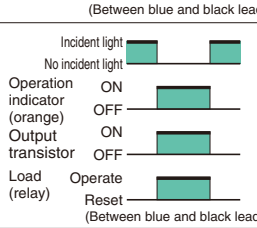
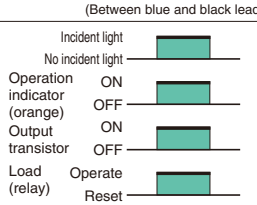
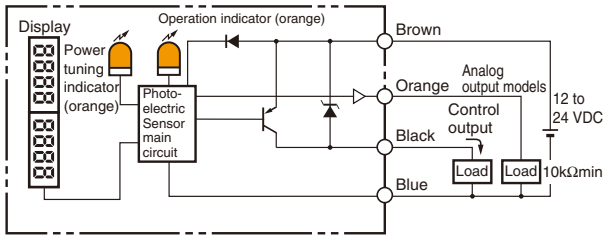
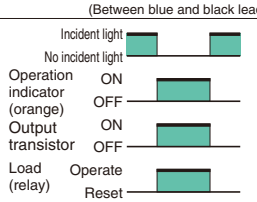
2. Timing Charts for Timer Function Settings (T: Set Time)

ON delay	OFF delay	One-shot
		

3. Control Output (AND, OR, Sync) and Timing Chart for Timer Settings (T: Set Time)



PNP Output

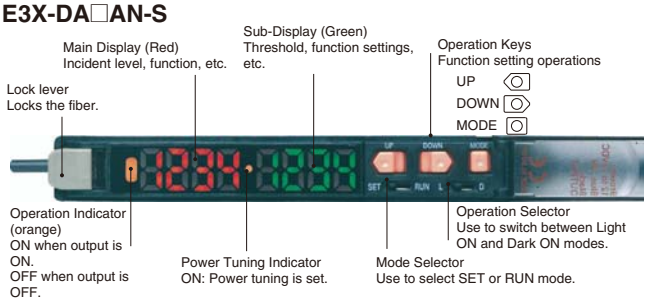
Model	Operation mode	Timing chart	Operation selector	Output circuit
E3X-DA41-S E3X-DA8-S E3X-DAG41-S E3X-DAG8-S E3X-DAB41-S E3X-DAB8-S E3X-DA41SE-S E3X-DA8SE-S	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	
E3X-DA41TW-S E3X-DA8TW-S E3X-MDA41 E3X-MDA8 E3X-DA41AT-S E3X-DA8AT-S	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	
E3X-DA41RM-S E3X-DA8RM-S	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	
E3X-DA41AN-S	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	

Note: The ON/OFF regions when areas settings are used with the E3X-DA□TW-S are as follows:
LIGHT ON: ON when the incident level is between the thresholds for channels 1 and 2.
DARK ON: OFF when the incident level is between the thresholds for channels 1 and 2.

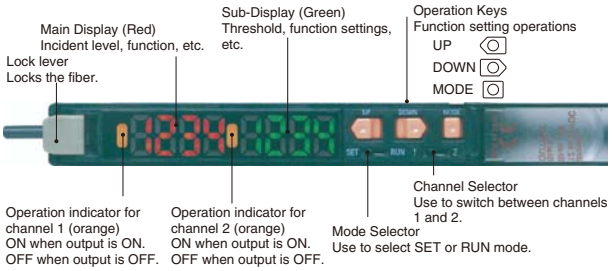
Nomenclature

Amplifier Units

E3X-DA□-S
E3X-DA□RM-S
E3X-DA□AN-S



E3X-DA□TW-S
E3X-DA□AT-S
E3X-MDA□



Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠ WARNING

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

Precautions for Correct Use

Do not use the product in atmospheres or environments that exceed product ratings.

Amplifier Unit

● Designing

Operation after Turning Power ON

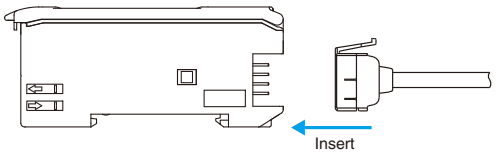
The Sensor is ready to detect within 200 ms after the power supply is turned ON. If the Sensor and load are connected to separate power supplies, be sure to turn ON the Sensor first.

● Mounting

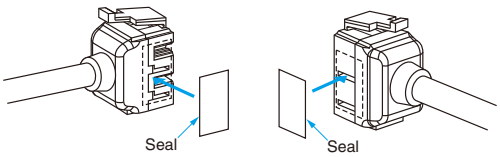
Connecting and Disconnecting Connectors

Mounting Connectors

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



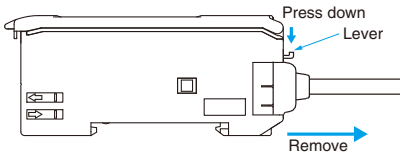
2. Attach the protector seals (provided as accessories) to the sides of master and slave connectors that are not connected.



Note: Attach the seals to the sides with grooves.

Removing Connectors

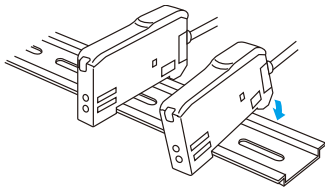
1. Slide the slave Amplifier Unit(s) for which the Connector is to be removed away from the rest of the group.
2. After the Amplifier Unit(s) has been separated, press down on the lever on the Connector and remove it. (Do not attempt to remove Connectors without separating them from other Amplifier Units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



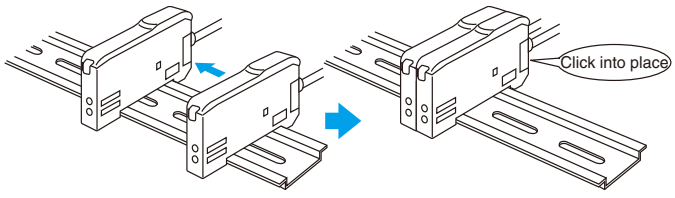
Adding and Removing Amplifier Units

Adding Amplifier Units

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



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



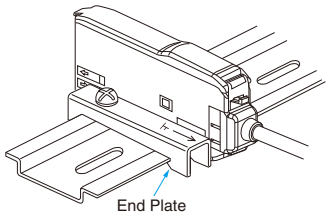
Removing Amplifier Units

Slide Amplifier Units away from each other, and remove from the DIN track one at a time. (Do not attempt to remove Amplifier Units from the DIN track without separating them first.)

Note: 1. The specifications for ambient temperature will vary according to the number of Amplifier Units used together. For details, refer to *Ratings and Specifications*.
2. Always turn OFF the power supply before joining or separating Amplifier Units.

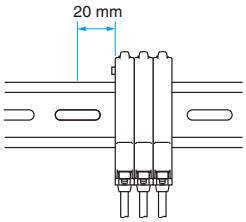
Mounting the End Plate (PFP-M)

An End Plate should be used if there is a possibility of the Amplifier Unit moving, e.g., due to vibration. If a Mobile Console is going to be mounted, connect the End Plate in the direction shown in the following diagram.



Mounting the Mobile Console Head

Leave a gap of at least 20 mm between the nearest Amplifier Unit and the Mobile Console head.

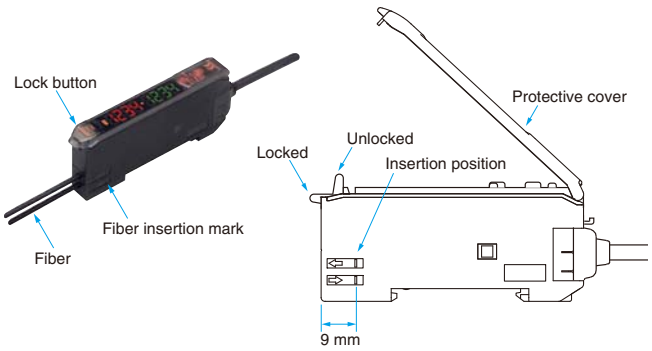


Fiber Connection

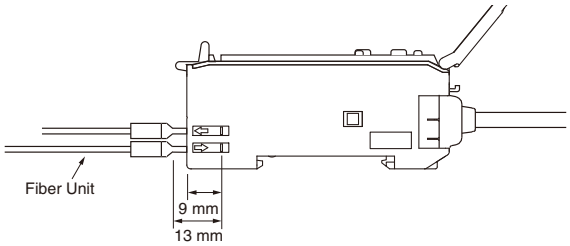
The E3X Amplifier Unit has a lock button for easy connection of the Fiber Unit. Connect or disconnect the fibers using the following procedures:

1. Connection

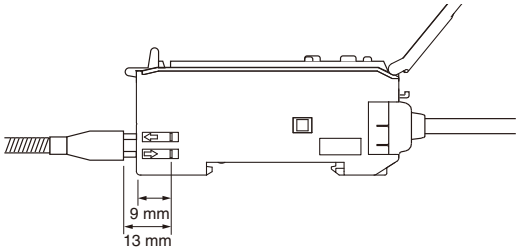
Open the protective cover, insert the fibers according to the fiber insertion marks on the side of the Amplifier Unit, and lower the lock lever.



Fibers with E39-F9 Attachment

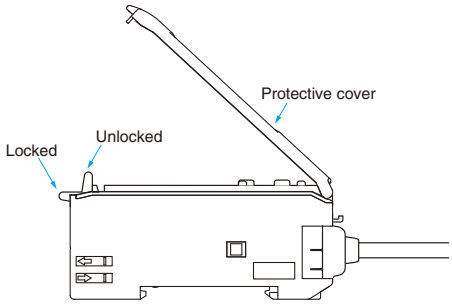


Fibers That Cannot Be Free-Cut (with Sleeves)



2. Disconnecting Fibers

Remove the protective cover and raise the lock lever to pull out the fibers.



Note: 1. To maintain the fiber properties, confirm that the lock is released before removing the fibers.
2. Be sure to lock or unlock the lock button within an ambient temperature range between −10°C and 40°C.

● Adjusting

Mutual Interference Protection Function

There may be some instability in the digital display values due to light from other sensors. If this occurs, decrease the sensitivity (i.e., decrease the power or increase the threshold) to perform stable detection.

EEPROM Writing Error

If the data is not written to the EEPROM correctly due to a power failure or static-electric noise, initialize the settings with the keys on the Amplifier Unit. ERR/EEP will flash on the display when a writing error has occurred.

Optical Communications

Several Amplifier Units can be slid together and used in groups. Do not, however, slide the Amplifier Units or attempt to remove any of the Amplifier Units during operation.

● Others

Protective Cover

Always keep the protective cover in place when using the Amplifier Unit.

Mobile Console

Use the E3X-MC11-SV2 Mobile Console for the E3X-DA-S-series Amplifier Units.

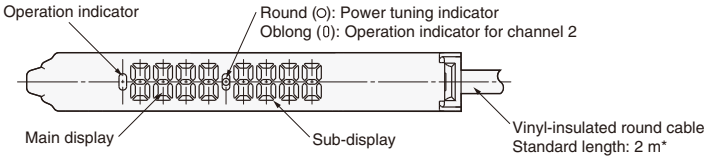
Dimensions

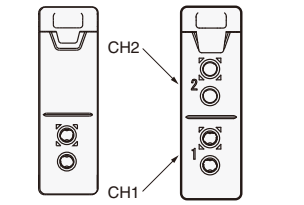
(Unit: mm)

Amplifier Units

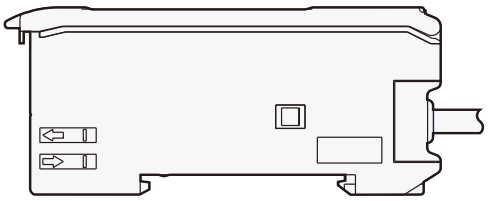
Amplifier Units with Cables

E3X-DA11-S
E3X-DA41-S
E3X-DAG11-S
E3X-DAG41-S
E3X-DAB11-S
E3X-DAB41-S
E3X-DA11RM-S
E3X-DA41RM-S
E3X-DA11TW-S
E3X-DA41TW-S
E3X-DA11SE-S
E3X-DA41SE-S
E3X-DA11AT-S
E3X-DA41AT-S
E3X-DA11AN-S
E3X-DA41AN-S
E3X-MDA11
E3X-MDA41





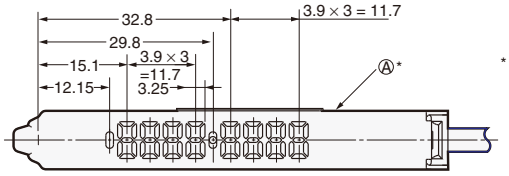
(E3X-DA□-S) (E3X-MDA□)



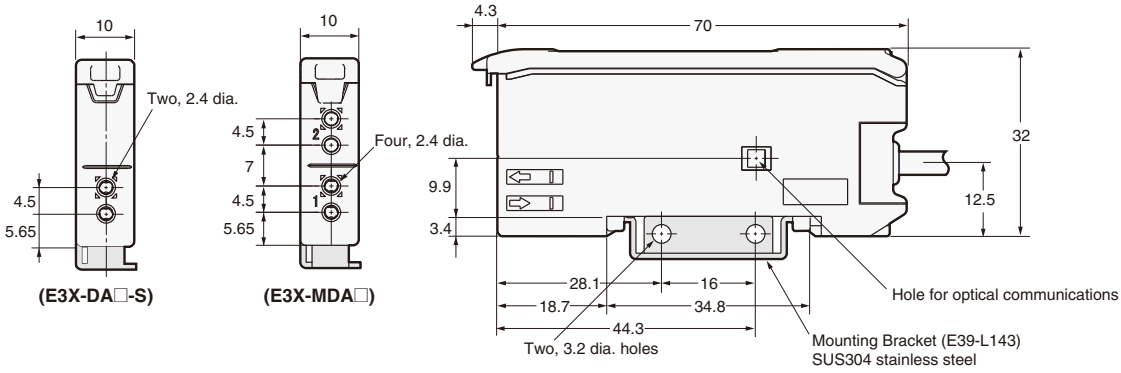
*Cable Specifications

E3X-DA11-S -DA41-S -DAG11-S -DAG41-S -DAB11-S -DAB41-S	4-dia., 3-conductor (Conductor cross section: 0.2 mm², insulator diameter: 1.1 mm)
E3X-DA11TW-S -DA41TW-S -DA11RM-S -DA41RM-S	4-dia., 4-conductor (Conductor cross section: 0.2 mm², insulator diameter, 1.1 mm)
E3X-MDA11 -MDA41	4-dia., 2-conductor (Conductor cross section: 0.2 mm², insulator diameter: 1.1 mm)

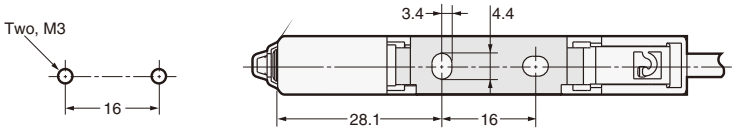
With Mounting Bracket Attached



* The Mounting Bracket can also be used on this side.



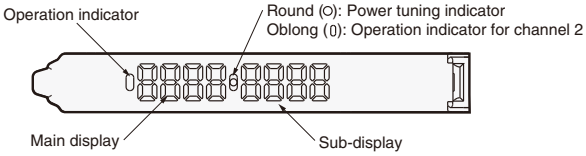
(E3X-DA□-S) (E3X-MDA□)

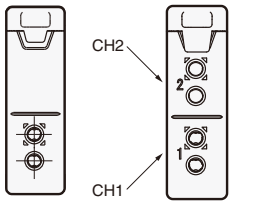


Mounting Holes

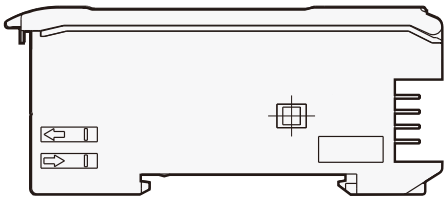
Amplifier Units with Connectors

E3X-DA6-S
E3X-DA8-S
E3X-DAG6-S
E3X-DAG8-S
E3X-DAB6-S
E3X-DAB8-S
E3X-DA6RM-S
E3X-DA8RM-S
E3X-DA6TW-S
E3X-DA8TW-S
E3X-DA6SE-S
E3X-DA8SE-S
E3X-DA6AT-S
E3X-DA8AT-S
E3X-MDA6
E3X-MDA8

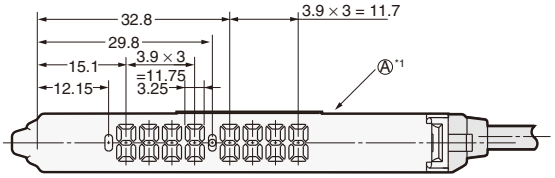




(E3X-DA□-S) (E3X-MDA□)

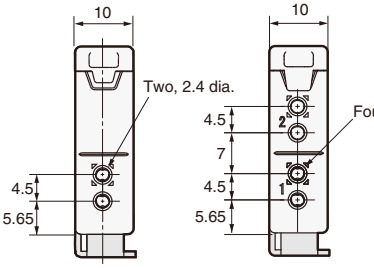


With Mounting Bracket Attached

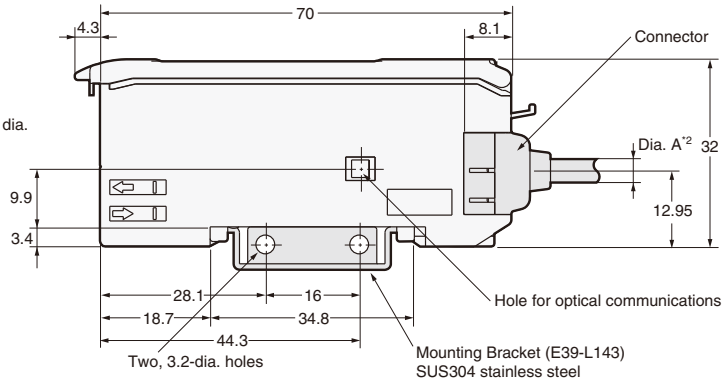


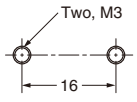
*1 The Mounting Bracket can also be used on this side.
*2 Cable Diameters

E3X-CN22 (2 conductors) E3X-CN21 (4 conductors) E3X-CN11 (3 conductors)	4.0-mm dia.
E3X-CN12 (1 conductor)	2.6-mm dia.

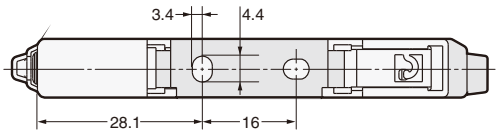


(E3X-DA□-S) (E3X-MDA□)



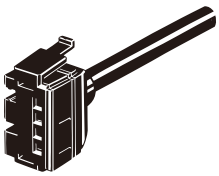


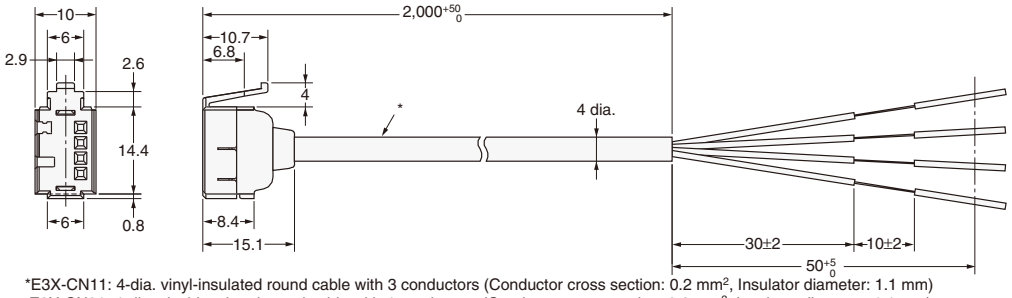
Mounting Holes



Amplifier Unit Connectors

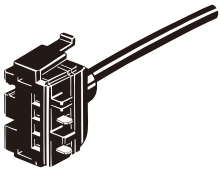
Master Connectors
E3X-CN11
E3X-CN21

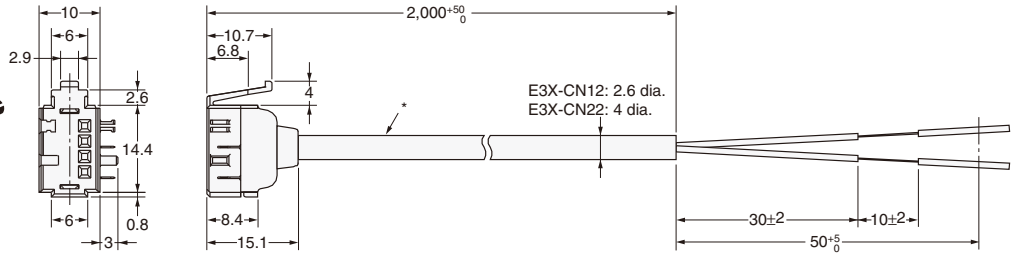




*E3X-CN11: 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm)
E3X-CN21: 4-dia. vinyl-insulated round cable with 4 conductors (Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm)

Slave Connectors
E3X-CN12
E3X-CN22



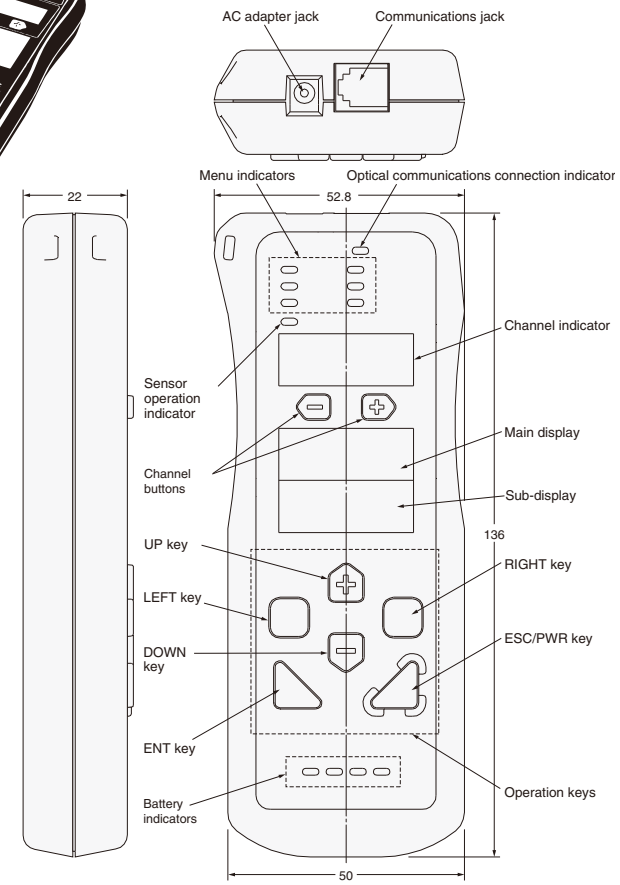


*E3X-CN12: 2.6-dia. vinyl-insulated round cable with 1 conductor (Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm)
E3X-CN22: 4-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.2 mm^2, Insulator diameter: 1.1 mm)

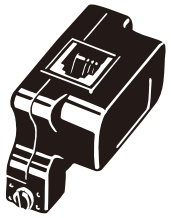
Mobile Console

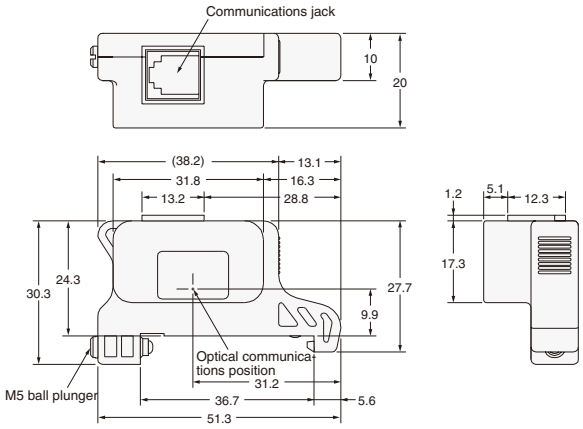
E3X-MC11-SV2

Mobile Console



Mobile Console Head

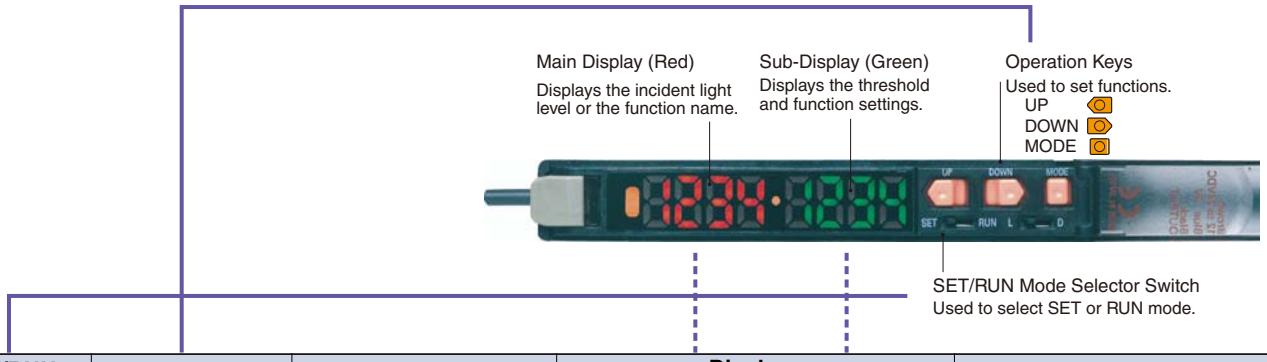




Refer to *E32 Series* for details on Fiber Units.

E3X-DA-S/E3X-MDA

Operation Reference



SET/RUN mode	Operation keys	Operation	Displays		Remarks
			Main display	Sub-display	
Detection/ adjustment	UP / DOWN	Adjusting thresholds	Incident level	Threshold	➜**Page 22** Refer to ***3. Setting Thresholds Manually***.
RUN (Factory-set to RUN)	MODE	Executing user-specified functions (factory-set to power tuning)	4000	1234	Used to execute power tuning and various teaching operations. ➜**Page 22.** Refer to ***2. Adjusting the Power***.
Function settings	UP / DOWN	Teaching and changing setting details	Setting item: tEch → 1-Fn → 2-tF	Setting: HS → Stnd → HrES	➜**Page 23.** Refer to ***4. Teaching the Threshold***.
SET	MODE	Switching settings			➜**Page 24** Refer to ***5. Setting Functions in SET Mode***.

SET/RUN mode	Operation keys	Operation	Displays		Remarks
			Main display	Sub-display	
RUN (Factory-set to RUN)	UP + MODE	Locking and unlocking keys	LOC: Loc	ON: on	Locks key operation to prevent incorrect operation. ➜**Page 28** Refer to ***6. Convenient Functions***.
SET	UP + DOWN	Initialization	INIT: In it	YES?: YES?	Returns the system to its default settings. ➜**Page 28** Refer to ***6. Convenient Functions***.

1 Setting the Operation Mode

The operation mode is set with the Mode Selector Switch.

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

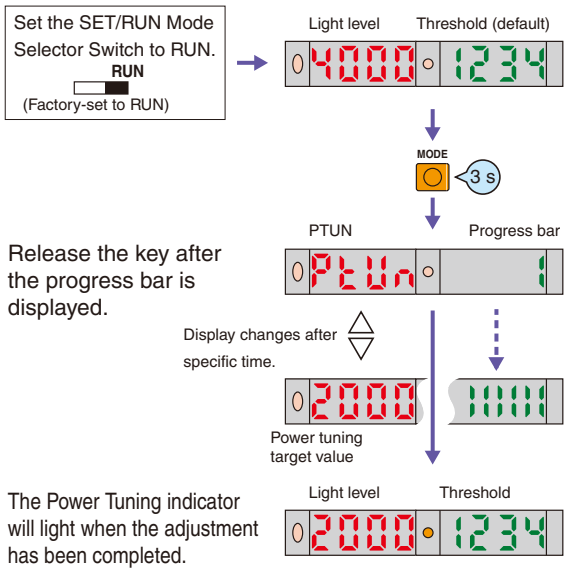
E3X-DA□TW-S/E3X-DA□AT-S/E3X-MDA:
The operation mode is set in SET mode.
➜**Refer to *5. Setting Functions in SET Mode*** on page 24.

E3X-DA□TW-S/E3X-DA□AT-S/E3X-MDA (Same for All Adjustments):
Set the Channel Selector Switch to the desired channel before making any adjustments or settings.

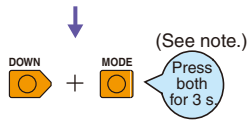
2 Adjusting the Power (RUN Mode)

The current incident light level can be adjusted near the power tuning target value (default: 2,000).

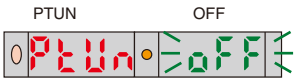
*Confirm that the MODE Key setting is PTUN (power tuning). The default setting is PTUN.
➜**Refer to *5. Setting Functions in SET Mode*** on page 24.
*If power tuning is executed while SHS is selected for the detection function, the minimum power will be set.



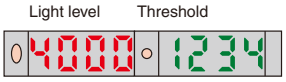
To restore the default power settings:



"OFF" will flash twice.



The Power Tuning indicator will go out when the default setting has been restored.



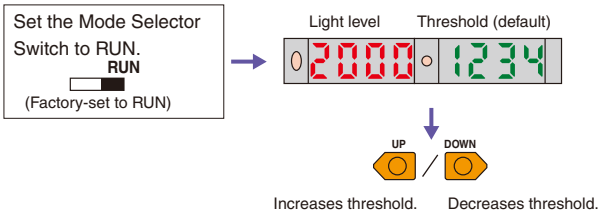
*Setting Errors
An error has occurred if one of the following displays appears after the progress bar is displayed.

Display	Error	Action
Flashes twice PTUN OVER	**Over Error** The incident light level is too low for the power tuning target value.	The power will not be tuned. The power can be increased up to approximately 5 times the incident light value.
Flashes twice PTUN BOTM	**Bottom Error** The incident light level is too high for the power tuning target value.	The power will be turned to the minimum level. The power can be decreased down to approximately 1/25th the incident light value.

Note: Press the DOWN Key right after pressing the MODE Key.

3 Setting Thresholds Manually (RUN Mode)

A threshold can be set manually. A threshold can also be adjusted manually after teaching to fine-tune it.



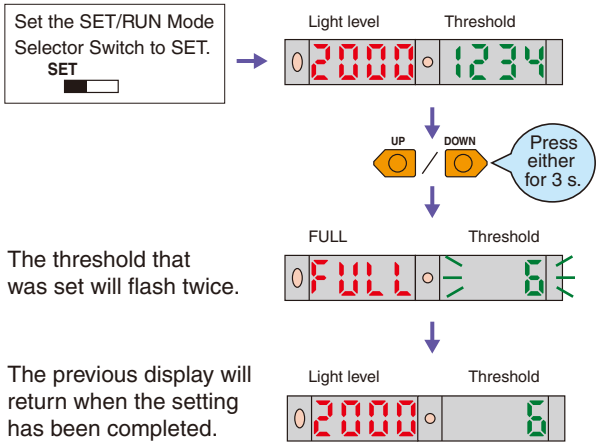
*Even if the display method is changed, the threshold will appear on the sub-display when the key is pressed.

4 Teaching the Threshold (SET Mode)

*There are four methods that can be used for teaching, as described below. Use the method most suitable for the application.
Teaching (with/without workpiece teaching and automatic teaching) can be performed in RUN mode.
For operating procedures, refer to the *Instruction Sheet* provided with the product.
*An error has occurred if OVER, LO, or NEAR is displayed on the sub-display. If that occurs, repeat the operation from the beginning.

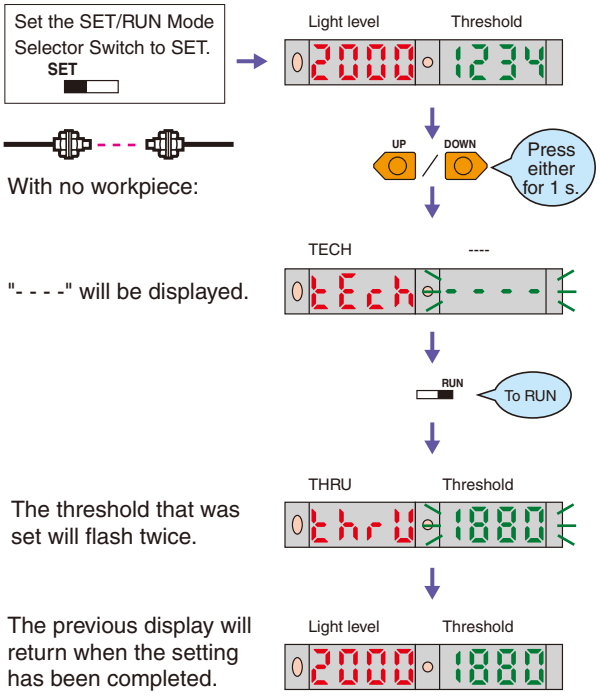
4-1. Setting the Threshold at Maximum Sensitivity

The threshold can be set to the maximum sensitivity. This method is ideal when using a Through-beam Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



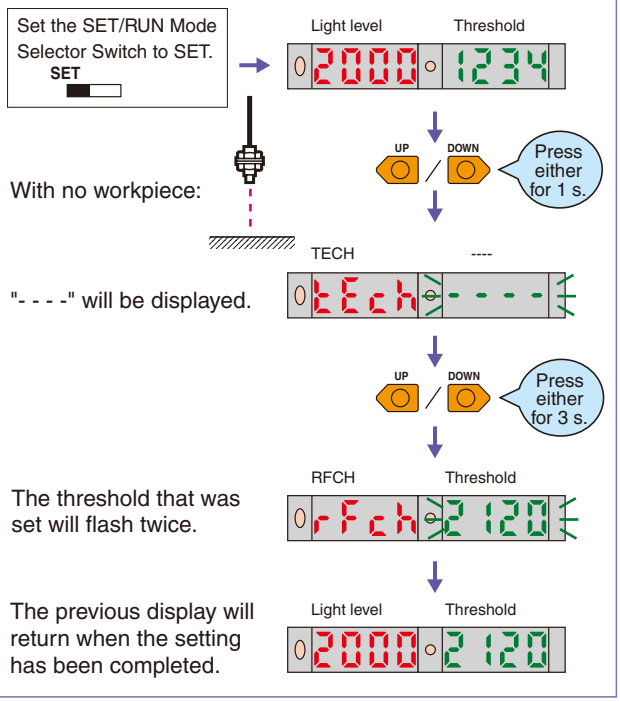
4-2. Teaching a Through-beam Fiber Unit without a Workpiece

A value about 6% less than the incident light level can be set as the threshold. This method is ideal when detecting very small differences in light level, such as when detecting very fine workpieces or transparent workpieces like transparent fibers.



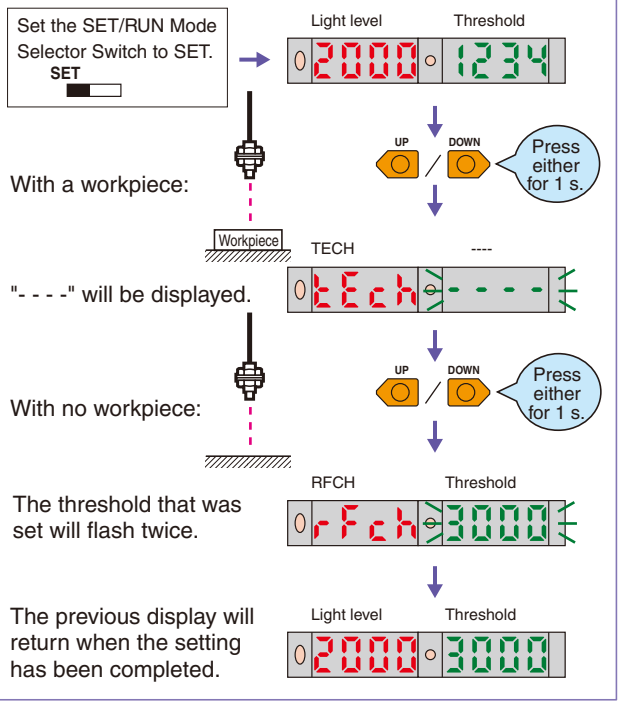
4-3. Teaching a Reflective Fiber Unit without a Workpiece

A value about 6% greater than the incident light level can be set as the threshold. This method is ideal when using a Reflective Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



4-4. Teaching with and without a Workpiece

Two points, with and without the workpiece, are detected, and the intermediate point is set as the threshold.



5 Setting Functions in SET Mode

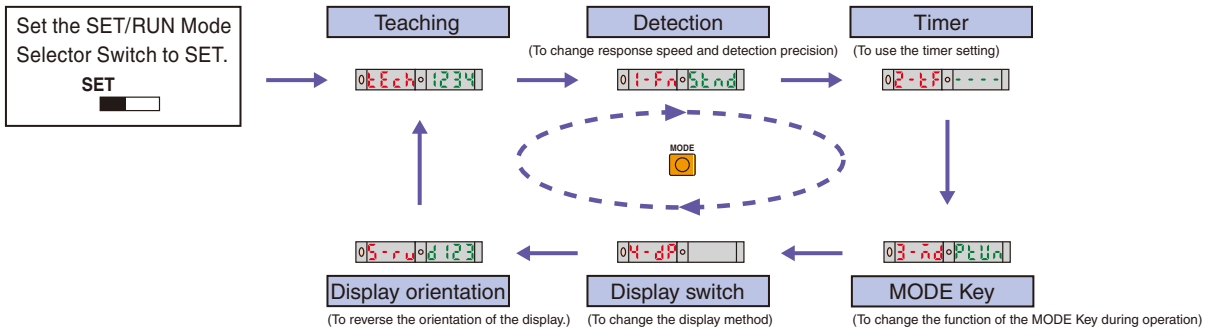
*The function transition boxes show the default settings.
*More functions may be displayed depending on the detailed settings.

Standard Mark Detection Models

E3X-DA□-S

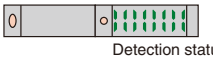
Moving between Functions

➜Refer to *4. Teaching the Threshold* on page 23.



Functions

UP / DOWN Use the UP and DOWN Keys to change the settings.

Function	Setting (display)	Description
Detection	Super-high-speed: SHS, High-speed: HS Standard: Stnd, High-precision: HrES	Used to change the response speed or detection precision.
Timer	Timer disabled: ----, OFF-delay timer: oFFd, ON-delay timer: on-d, One-shot timer: 1Sht	Used to enable or disable timers.
Time (timer enabled)	1 to 20 ms: 1-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change timer settings when timers are enabled. The timer can be set from 1 to 5000 ms.
MODE Key	Executes power tuning: PtUn, Executes a zero reset: 0rSt, With/without workpiece teaching: 2Pnt, Automatic teaching: AUto	Used to change the function of the MODE Key during operation.
Power tuning target value (performing power tuning)	Setting range: 100 to 3,900 (increments of 100) Maximum power M: FULL	Used to set target values during power tuning. ➜Refer to *2. Adjusting the Power* on page 22.
Display switch		Used to display the incident light level and the threshold.
		Used to display the incident light level as a percentage of the threshold and the threshold.
		Used to display the peak and bottom levels of incident light within a set time. (Updated every 2 s.)
		Use to display the incident light peak level and no incident light bottom level. (Refreshed when output turns ON or OFF.)
		Analog bar display. The current detection status is displayed as an analog bar. The bar will lengthen from the right as ON status is reached. (ON: Red, OFF: Green)
		Used to display the current incident light level and the peak incident light level. Display changes at a fixed interval.
		Used to display the incident light level and the channel.
Display orientation	Normal display: d123, Up/down reversed display: E2iP	Used to reverse the orientation of the display.

5 Setting Functions in SET Mode

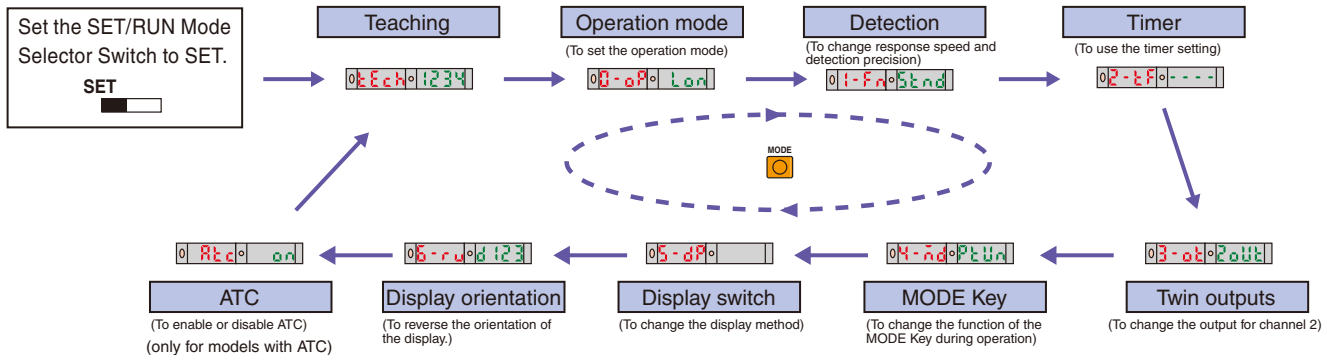
*The function transition boxes show the default settings.
*More functions may be displayed depending on the detailed settings.

Advanced (Twin-output, ATC) Models

E3X-DA□TW-S and E3X-DA□AT-S

Moving between Functions

➜Refer to *4. Teaching the Threshold* on page 23.



Functions

(Only functions not supported by standard models are listed. For information on basic functions, refer to information on the standard models.)

UP / DOWN Use the UP and DOWN Keys to change the settings.

Function	Setting (display)	Description
Operation mode	Light ON: Lon, Dark ON: don,	➜**Refer to *1. Setting the Operation Mode*** on page 22.
Detection	Super-high-speed: SHS, High-speed: HS, Standard: Stnd, High-precision: HrES, Differential operation: d IFF (advanced models only)	Used to change the response speed and detection precision.
Differential edge (differtial operation selected)	Single edge: _F_, Double edge: _A_	Used to set the edge to be detected.
Differential time	Single edge···250 µs: 1, 500 µs: 2, 1 ms: 3, 10 ms: 4, 100 ms: 5, Double edge···500 µs: 1, 1 ms: 2, 2 ms: 3, 20 ms: 4, 200 ms: 5	Used to set the differential response time.
Twin outputs	ATC error output: AtAL (ATC models only), Output for each channel: 2oUt, Output if level is between the two thresholds: ArEA, Self-diagnosis output: SELF	Used to change the output for channel 2. This setting is disabled if differential operation is set for the detection function. (Alarm outputs are always used for differential operation.)
ATC (E3X-DA□AT-S only)	ATC enabled: on, ATC disabled: oFF	Used to enable or disable ATC.
Setting at Power-ON (ATC ON)	No setting: oFF, ATC start processing: Atc, Power tuning and ATC start processing: PtAt	Used to set the processing to be performed when the power is turned ON.

5 Setting Functions in SET Mode

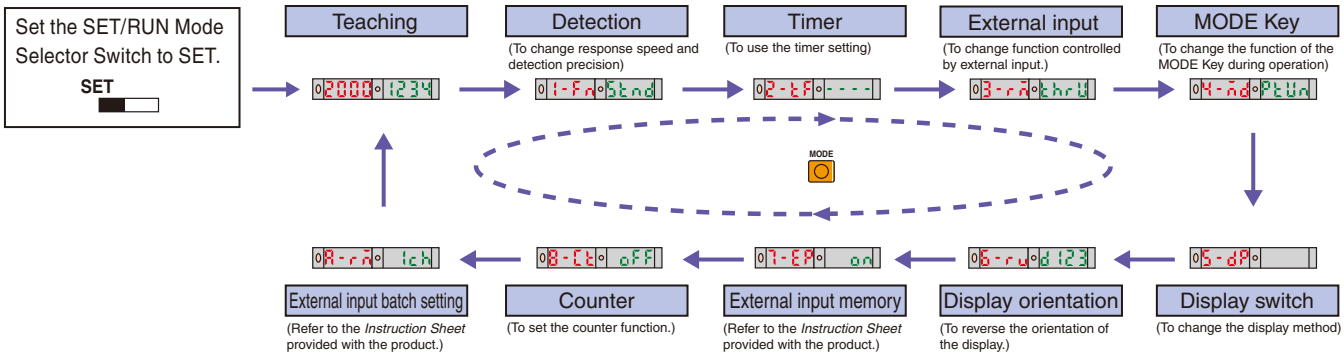
*The function transition boxes show the default settings.
*More functions may be displayed depending on the detailed settings.

Advanced (External Input) Models

E3X-DA□RM-S

Moving between Functions

➜Refer to *4. Teaching the Threshold* on page 23.



Functions (Only functions not supported by standard models are listed. For information on basic functions, refer to information on the standard models.)

UP / DOWN Use the UP and DOWN Keys to change the settings.

Function		Setting (display)	Description
Detection		Super-high-speed: SHS, High-speed: HS, Standard: Stnd, High-precision: HrES, Differential operation: d IFF (advanced models only)	Used to increase the response speed and detection precision.
	Differential edge (differtial operation selected)	Single edge: _F_, Double edge: _M_	Used to set the edge to be detected.
	Differential time	Single edge···250 µs: 1, 500 µs: 2, 1 ms: 3, 10 ms: 4, 100 ms: 5, Double edge···500 µs: 1, 1 ms: 2, 2 ms: 3, 20 ms: 4, 200 ms: 5	Used to set the differential response time.
External input		Through-beam, no-workpiece teaching: thrU, Reflective, no-workpiece teaching: rFct, With/Without-workpiece teaching: 2Pnt, Automatic teaching: AUto, Power tuning: PtUn, Zero reset: 0rSt, Light OFF: LoFF, Counter reset: crSt	Used to change function controlled by external input. (Refer to *Instruction Sheet* provided with the product.)
Display switch (Settings are added.)		0c 112 3286 Count	Used to display the counter value.
External input memory		Write results to EEPROM: on, Don't write results: oFF	Used to set writing the results. (Refer to *Instruction Sheet* provided with the product.)
Counter		Counter disabled: oFF, Count incremented when output turns ON: cUP, Count decremented when output turns ON: cdo	Used to set the counter function.
	Count	Setting range: 1 to 9,999,999	Used to set the counter value when the counter function is enabled.
External input batch setting		Only Sensor that receives external input: Ich, All linked Sensors: ALL	Used to set linked Amplifiers at the same time using an external input.

5 Setting Functions in SET Mode

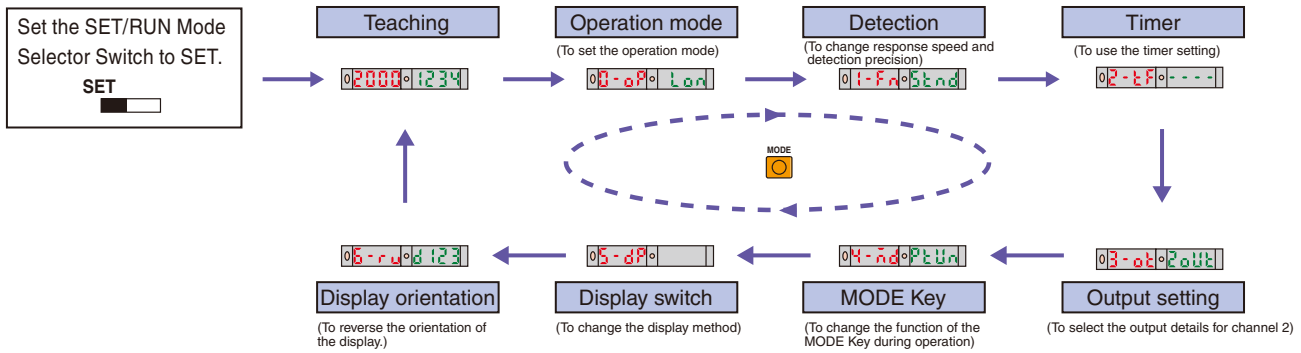
*The function transition boxes show the default settings.
*More functions may be displayed depending on the detailed settings.

Two-channel Models

E3X-MDA

Moving between Functions

➜Refer to *4. Teaching the Threshold* on page 23.



Functions (Only functions not supported by standard models are listed. For information on basic functions, refer to information on the standard models.)

UP / DOWN Use the UP and DOWN Keys to change the settings.

Function		Setting (display)	Description
Operation mode		Light ON: Lon, Dark ON: don	➜Refer to *1. Setting the Operation Mode* on page 22.
Output setting		Each channel: 2oUt, AND: And, OR: or, Rising edge synchronization: S_F, Falling edge synchronization: S_L, Differential operation: 1-2	Used to change the output details for channel 2.
	Timer function for output setting	Timer disabled: ----, OFF-delay timer: oFFd, ON-delay timer: on-d, One-shot timer: 1Sht	Used to enable or disable the timer function for output settings of channel 2.
	Timer time	1 to 20 ms: 1-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change timer setting when timer is enabled. The timer can be set from 1 to 5,000 ms.

Note: The operation mode and timer function can be set for each channel. The setting will be executed for channels specified using the Channel Selector Switch.

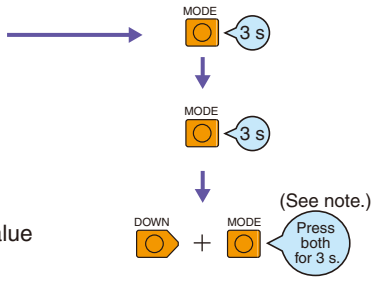
6 Convenient Functions

6-1. Zeroing the Digital Display (Zero Reset)

The incident light level on the main display can be set to 0.

*Change the function to 0RST (zero reset) with the MODE Key.
The default setting is PTUN.
➜**Refer to *5. Setting Functions in SET Mode*** on page 24.

Set the SET/RUN Mode Selector Switch to RUN.
RUN
Factory setting



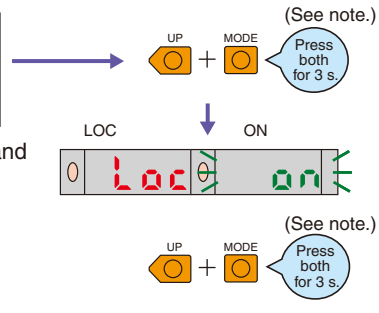
To reset to 0 again:

To return to original value for incident light level:

6-2. Locking the Keys (Key Lock)

All key operations can be disabled.

Set the SET/RUN Mode Selector Switch to RUN.
RUN
Factory setting



"ON" will flash twice and key operations will be disabled.

To release the lock:

"OFF" will flash twice and key operations will be disabled.

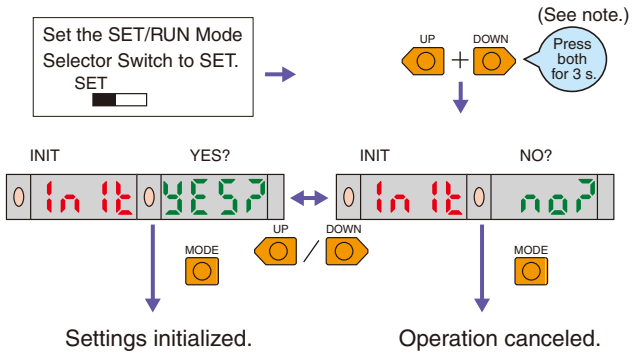
*If a key is pressed while key operations are locked, "LOC" will flash twice on the display to indicate that key operations have been disabled.

Note: Press the DOWN or UP Key right after pressing the MODE Key.

6-3. Initializing Settings (Initial Reset)

All settings can be returned to their original default settings.

Set the SET/RUN Mode Selector Switch to SET.
SET



General Precautions

For precautions on individual products, refer to *Safety Precautions* in individual product information.

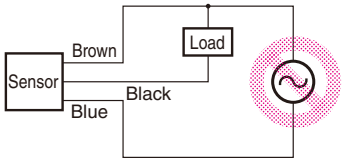
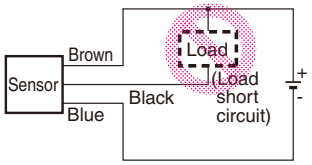
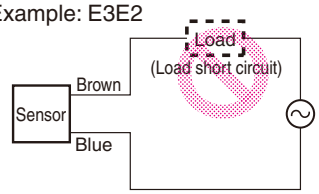
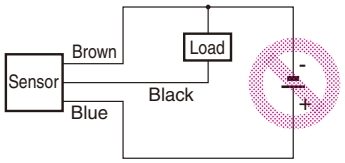
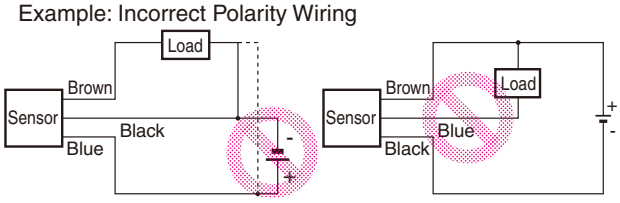
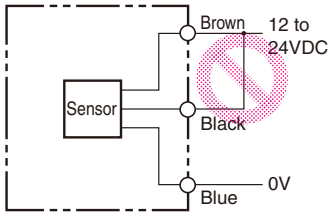
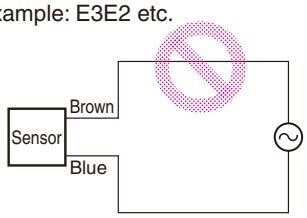
⚠ WARNING

These Sensors cannot be used in safety devices for presses or other safety devices used to protect human life. These Sensors are designed for use in applications for sensing workpieces and workers that do not affect safety.

Precautions for Safe Use

To ensure safety, always observe the following precautions.

● Wiring

Item	Typical examples	
Power Supply Voltage Do not use a voltage in excess of the operating voltage range. Applying a voltage in excess of the operating voltage range, or applying AC power (100 VAC or greater) to a DC Sensor may cause explosion or burning.	• DC Three-wire NPN Output Sensors 	---
Load Short-circuiting Do not short-circuit the load. Doing so may cause explosion or burning.	• DC Three-wire NPN Output Sensor 	• AC Two-wire Sensors Example: E3E2 
Incorrect Wiring Do not reverse the power supply polarity or otherwise wire incorrectly. Doing so may cause explosion or burning.	• DC Three-wire NPN Output Sensors Example: Incorrect Polarity 	• DC Three-wire NPN Output Sensors Example: Incorrect Polarity Wiring 
Connection without a load If the power supply is connected directly without a load, the internal elements may burst or burn. Be sure to insert a load when connecting the power supply.	• DC Three-wire NPN Output Sensors 	• AC 2-wire Sensors Example: E3E2 etc. 

● Operating Environment

(1) Do not use a Sensor in an environment where there are explosive or inflammable gases.
(2) Do not use the Sensor in environments where the cables may become immersed in oil or other liquids or where liquids may penetrate the Sensor. Doing so may result in damage from burning and fire, particularly if the liquid is flammable.

Precautions for Correct Use

● **Design**

Power Reset Time

The Sensor will be ready to detect within approximately 100 ms after the power is turned ON.
If the Sensor and the load are connected to separate power supplies, turn ON the Sensor power before turning ON the load power. Any exceptions to this rule are indicated in *Safety Precautions* in individual product information.

Turning OFF Power

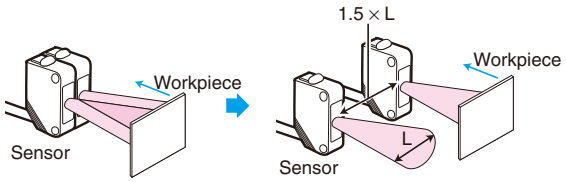
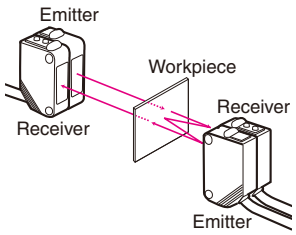
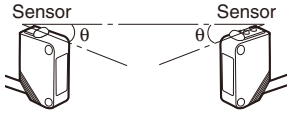
An output pulse may be generated when the power is turned OFF. It is recommended that the load or load line power be turned OFF before the Sensor power is turned OFF.

Power Supply Types

An unsmoothed full-wave or half-wave rectifying power supply cannot be used.

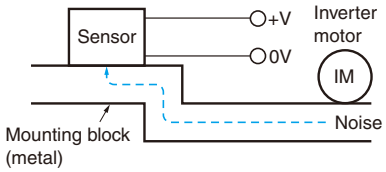
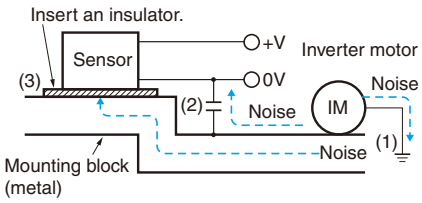
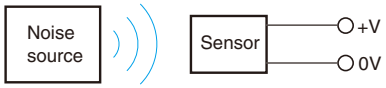
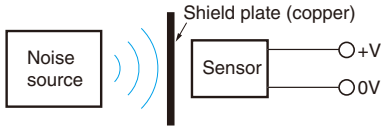
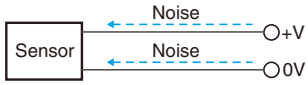
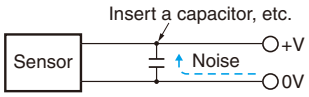
Mutual Interference

Mutual interference is a state where an output is unstable because the Sensors are affected by light from the adjacent Sensors.
The following measures can be taken to avoid mutual interference.

Counter-measure	Concept	Through-beam Sensors	Reflective Sensors
1	Use a Sensor with the interference prevention function.	If Sensors are mounted in close proximity, use Sensors with the interference prevention function. 10 or fewer Sensors: E3X-DA□-S, E3X-MDA, E3C-LDA Fiber Sensors Performance, however, will depend on conditions. Refer to pages E3X-DA-S/E3X-MDA and E3C-LDA. 5 or fewer Sensors: E3X-NA Fiber Sensors 2 or fewer Sensors: E3T, E3Z, E3ZM, E3ZM-C, E3S-C, E3G-L1/L3, or E3S-C Built-in Amplifier Photoelectric Sensors (except Through-beam Sensors) E3C Photoelectric Sensor with separate amplifier	
2	Install an inference prevention filter.	A mutual interference prevention polarizing filter can be installed on only the E3Z-TA to allow close-proximity mounting of up to 2 Sensors. Mutual Interference Prevention Polarizing Filter: E39-E11	---
3	Separate Sensors to distance where interference does not occur.	Check the parallel movement distance range in the catalog, verify the set distance between adjacent Sensors, and install the Sensors accordingly at a distance at least 1.5 times the parallel movement distance range.	If the workpieces move from far to near, chattering may occur in the vicinity of the operating point. For this type of application, separate the Sensors by at least 1.5 times the operating range. 
4	Alternate Emitters and Receivers.	Close mounting of Sensors is possible by alternating the Emitters with the Receivers in a zigzag fashion (up to two Sensors). However, if the workpieces are close to the Photoelectric Sensors, light from the adjacent Emitter may be received and cause the Sensor to change to the incident light state. 	---
5	Offset the optical axes.	If there is a possibility that light from another Sensor may enter the Receiver, change the position of the Emitter and Receiver, place a light barrier between the Sensors, or take other measures to prevent the light from entering the Receiver. (Light may enter even if the Sensors are separated by more than the sensing distance.)	If Sensors are mounted in opposite each other, slant the Sensors as shown in the following diagram. (This is because the Sensors may affect each other and cause output chattering even if separated by more than the Sensor sensing distance.) 
6	Adjust the sensitivity.	Lowering the sensitivity will generally help.	

Noise

Countermeasures for noise depend on the path of noise entry, frequency components, and wave heights. Typical measures are as given in the following table.

Type of noise	Noise intrusion path and countermeasure	
	Before countermeasure	After countermeasure
Common mode noise (inverter noise) (Common noise applied between the mounting board and the +V and 0-V lines, respectively.)	Noise enters from the noise source through the frame (metal). 	(1) Ground the inverter motor (to 100 Ω or less) (2) Ground the noise source and the power supply (0-V side) through a capacitor (film capacitor, 0.22 μF, 630 V). (3) Insert an insulator (plastic, rubber, etc.) between the Sensor and the mounting plate (metal). 
Radiant noise (Ingress of high-frequency electromagnetic waves directly into Sensor, from power line, etc.)	Noise propagates through the air from the noise source and directly enters the Sensor. 	• Insert a shield (copper) plate between the Sensor and the noise source e.g., a switching power supply). • Separate the noise source and the Sensor to a distance where noise does not affect operation. 
Power line noise (Ingress of electromagnetic induction from high-voltage wires and switching noise from the switching power supply)	Noise enters from the power line. 	• Insert a capacitor (e.g., a film capacitor), noise filter (e.g., ferrite core or insulated transformer), or varistor in the power line. 

● Wiring

Cable

Unless otherwise indicated, the maximum length of cable extension is 100 m using wire that is 0.3 mm^2 or greater.
Exceptions are indicated in ***Safety Precautions*** in individual product information.

Cable Tensile Strength

When wiring the cable, do not subject the cable to a tension greater than that indicated in the following table.

Cable diameter	Tensile strength
Less than 4 mm	30 N max.
4 mm or greater	50 N max.

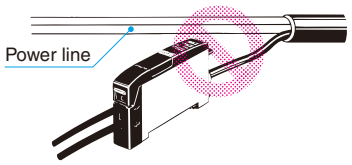
Note: Do not subject a shielded cable or coaxial cable to tension.

Repeated Bending

Normally, the Sensor cable should not be bent repeatedly.
(For bending-resistant cable, see ***Attachment to Moving Parts*** on page **C-4**.)

Separation from High Voltage (Wiring Method)

Do not lay the cables for the Sensor together with high-voltage lines or power lines. Placing them in the same conduit or duct may cause damage or malfunction due to induction interference. As a general rule, wire the Sensor in a separate system, use an independent metal conduit, or use shielded cable.



Work Required for Unconnected Leads

Unused leads for self-diagnosis outputs or other special functions should be cut and wrapped with insulating tape to prevent contact with other terminals.

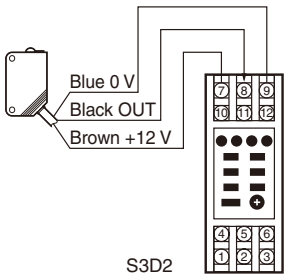
Power Supply

When using a commercially available switching regulator, ground the FG (frame ground) and G (ground) terminals.
If not grounded, switching noise in the power supply may cause malfunction.

Example of Connection with S3D2 Sensor Controller

DC Three-wire NPN Output Sensors

Reverse operation is possible using the signal input switch on the S3D2.



● Mounting

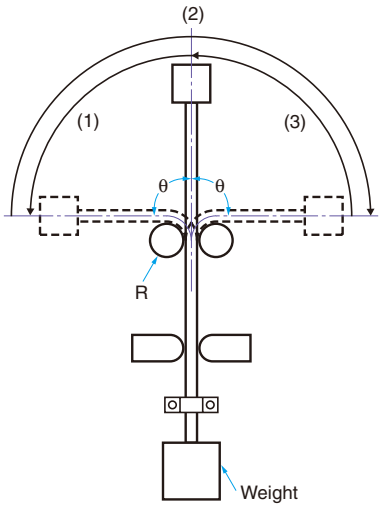
Attachment to Moving Parts

To mount the Photoelectric Sensor to a moving part, such as a robot hand, consider using a Sensors that uses a bending-resistant cable (robot cable).

Although the bending repetition tolerance of a standard cable is approximately 13,000 times, robot cable has an excellent bending tolerance of approximately 500,000 times.

Cable Bending Destruction Test (Tough Wire Breaking Test)

With current flowing, bending is repeated to check the number of bends until the current stops.



Test	Specimen	Standard cable VR (H) 3 x18/0.12	Robot cable: Strong, conductive electrical wire 2 x 0.15 mm², shielded
Description/conditions	Bending angle (θ)	Left/right 90° each	Left/right 45° each
	Bending repetitions	---	60 bends/minute
	Weight	300g	200g
	Operation per bending	(1) through (3) in figure once	(1) through (3) in figure once
	Bending radius of support points (R)	5 mm	2.5 mm
Result		Approx. 13,000 times	Approx. 500,000 times

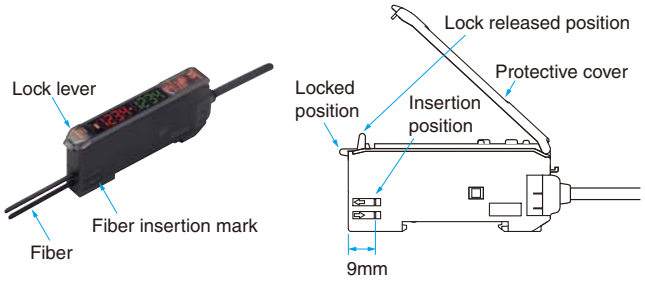
The testing conditions of the standard cable and robot cable are different.
Refer to the values in the above table to check bend-resistant performance under actual working conditions.

Securing Fibers

The E3X Fiber Unit uses a one-touch locking mechanism. Use the following methods to attach and remove Fiber Units.

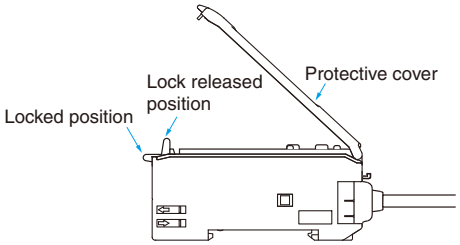
(1) Attaching Fibers

Open the protective cover, insert the fiber up to the insertion mark on the side of the Fiber Unit, and then lower the lock lever.



(2) Removing Fibers

Open the protective cover, lift up the lock lever, and pull out the fibers.

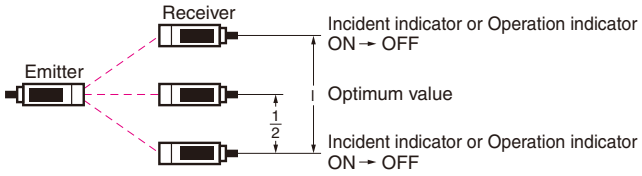


Note: 1. To maintain the fiber characteristics, make sure that the lock is released before removing the fibers.
2. Lock and unlock the fibers at an ambient temperature of −10 to 40°C.

● Adjustments

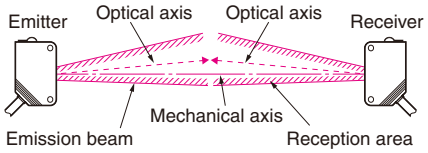
Optical Axis Adjustment

Move the Photoelectric Sensor both vertically and horizontally and set it in the center of the range in which the operation indicator is lit or not lit. For the E3S-C, the optical axis and the mechanical axis are the same, so the optical axis can be easily adjusted by aligning the mechanical axis.



Optical axis: The axis from the center of the lens to the center of the beam for the Emitter and the axis from the center of the lens to the center of the reception area for the Receiver.

Mechanical axis: The axis perpendicular to the center of the lens.



● Operating Environment

Water Resistance

Do not use in water, in rain, or outside.

Ambient Conditions

Do not use this Sensor in the following locations. Otherwise, it may malfunction or fail.

(1) Locations exposed to excessive dust and dirt
(2) Locations exposed to direct sunlight
(3) Locations with corrosive gas vapors
(4) Locations where organic solvents may splash onto the Sensor
(5) Locations subject to vibration or shock
(6) Locations where there is a possibility of direct contact with water, oil, or chemicals
(7) Locations with high humidity and where condensation may result

Environmentally Resistive Sensors

The E32-T11F/T12F/T14F/T81F-S/D12F/D82F and E3HQ can be used in locations (3) and (6) above.

Optical Fiber Photoelectric Sensors in Explosive Gas Atmospheres

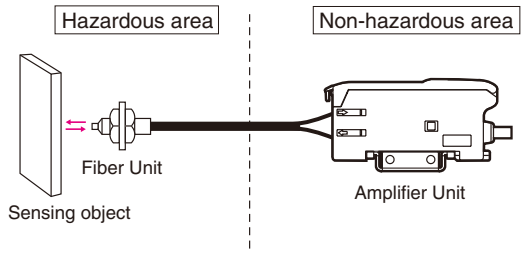
The Fiber Unit can be installed in the hazardous area, and the Amplifier Unit can be installed in a non-hazardous area.

<Reason>

For explosion or fire due to electrical equipment to occur, both the hazardous atmosphere and a source of ignition must be in the same location. Optical energy does not act as an ignition source, thus there is no danger of explosion or fire. The lens, case, and fiber covering are made of plastic, so this setup cannot be used if there is a possibility of contact with solvents that will corrode or degrade (e.g., cloud) the plastic.

<Ignition Source>

Electrical sparks or high-temperature parts that have sufficient energy to cause explosion in a hazardous atmosphere are called ignition sources.



Influence from External Electrical Fields

Do not bring a transceiver near the Photoelectric Sensor or its wiring, because this may cause incorrect operation.

● Maintenance and Inspection

Points to Check When the Sensor Does Not Operate

- If the Sensor does not operate, check the following points.

(1) Are the wiring and connections correct?
(2) Are any of the mounting screws loose?
(3) Are the optical axis and sensitivity adjusted correctly?
(4) Do the sensing object and the workpiece speed satisfy the ratings and specifications?
(5) Are any foreign objects, such as debris or dust, adhering to the Emitter lens or Receiver lens?
(6) Is strong light, such as sunlight (e.g., reflected from a wall), shining on the Receiver?
(7) Do not attempt to disassemble or repair the Sensor under any circumstances.
(8) If you determine that the Sensor clearly has a failure, immediately turn OFF the power supply.

Lens and Case

The lens and case of the Photoelectric Sensor are primarily made of plastic. Dirt should be gently wiped off with a dry cloth. Do not use thinner or other organic solvents.

- The case of the E3ZM, E3ZM-C and E3S-C is metal. The lens, however, is plastic.

● Accessories

Using a Reflector (E39-R3/R37/RS1/RS2/RS3)

During Application

(1) When using adhesive tape on the rear face, apply it after washing away oil and dust with detergent. The Reflector cannot be mounted if there is any oil or dirt remaining.
(2) Do not press on the E39-RS1/RS2/RS3 with metal or a fingernail.This may weaken performance.
(3) This Sensor cannot be used in locations where oil or chemicals may splash on the Sensor.

M8 and M12 Connectors

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

● Others

Values Given in Typical Examples

The data and values given as typical examples are not ratings and performance and do not indicate specified performance. They are rather values from samples taken from production lots, and are provided for reference as guidelines. Typical examples include the minimum sensing object, engineering data, step (height) detection data, and selection list for specifications.

Cleaning

- Keep organic solvents away from the Sensor. Organic solvents will dissolve the surface.
- Use a soft, dry cloth to clean the Sensor.

Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

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- Systems, machines, and equipment that could present a risk to life or property.

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