

Digital Fiber Amplifier

E3X-DA-N

CSM_E3X-DA-N_DS_E_7_1

Manufacturing of the E3X-DA□TW Series was discontinued at the end of March 2012.

The Ultimate Fiber Amplifier for Maximum Ease of Use and High Performance



Be sure to read *Safety Precautions* on page 23.

UL991*

* UL certification including UL 991 testing and evaluation • Applicable standards: UL 3121-1
• Additional application testing and evaluations standards: UL 991 and SEMI S2-0200S

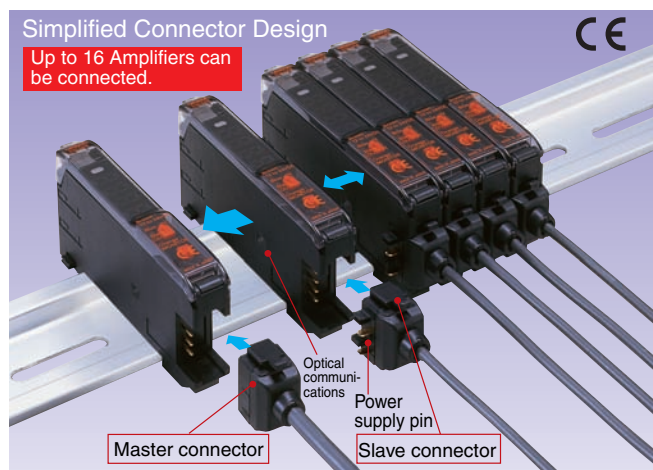
Features

Models with New Connector System Reduces Wiring, Saves Space, and Makes Maintenance Easier

First in the Industry **Patent Pending**

In Amplifiers with wire-saving connectors, the power supply is distributed to 1-conductor slave connectors through a 3-conductor 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 and costs are reduced.
3. Storage and maintenance are simpler because it isn't necessary to distinguish between master connector and slave connectors on the Amplifier.

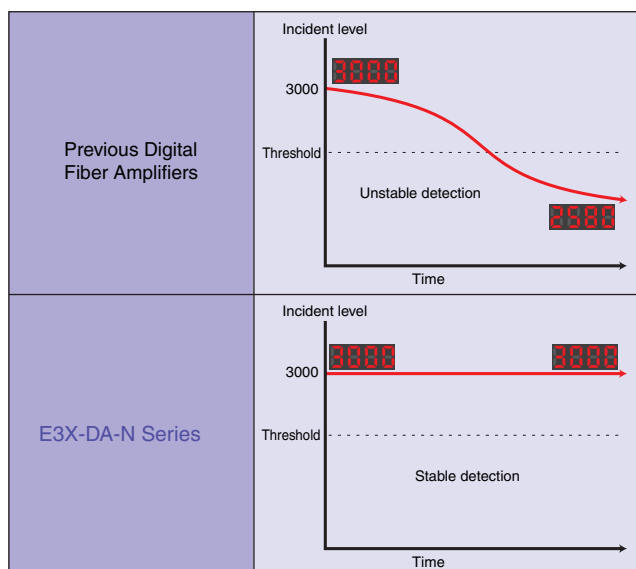


Super Digital Display with Auto Power Control (APC) Circuit

First in the Industry

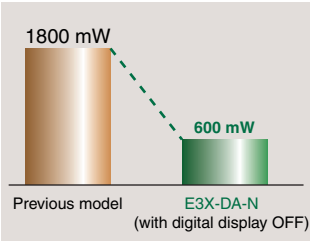
The passage of time causes the intensity of the Sensor's light-emitting LED elements to deteriorate, which may make stable detection impossible.

The E3X-DA-N is the first series of Fiber Sensors to use an Auto Power Control (APC) circuit. This achieves strict detection by eliminating fluctuation in the digital value and is ideal for subtle detection such as stable detection of liquid-crystal glass.



Power Consumption Reduced by As Much As 70%

Power consumption is reduced by as much as 70% from 1800 mW to 600 mW (when the digital display is OFF).



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. (Eco-mode can be set from the Mobile Console only.)

New Generation of Mobile Consoles the Size of Cellular Phones. Further Developing the Ultimate Power of Fiber Amplifiers.

Remote Setting and Adjustment

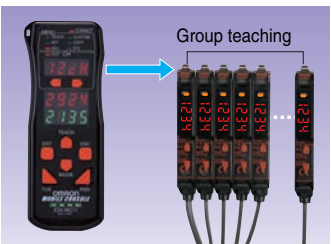
Perform settings, teaching, and fine adjustments at the end of the Fiber Unit.

Previously, settings and teaching could be performed only on the Amplifier. Now, however, using a Mobile Console enables these operations at the end of the fiber. Strict adjustments can be made while checking the workpiece position.



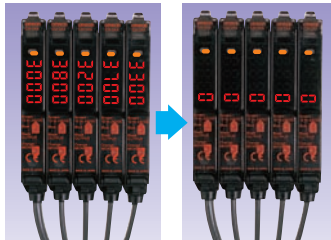
With group teaching, teach multiple amplifiers simultaneously.

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.

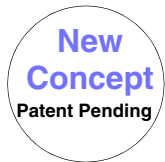


Eliminate inconsistency by using group zero reset.

The group zero reset function can simultaneously reset the digital displays of multiple Amplifiers to 0. This function is useful to minimize variation between Amplifier values.

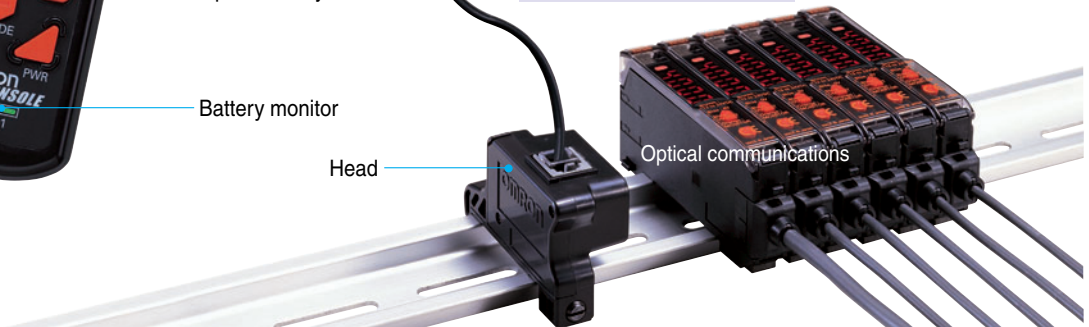


Display the light intensity and threshold at the same time.



Flash the Sensor head and display the amplifier channels during operation.

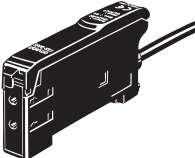
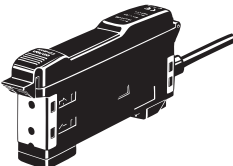
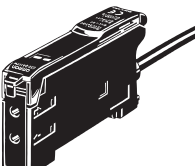
Even if the Amplifier and Sensor head are separated during operation, it is still possible to flash the Sensor head and display the amplifier channels.



Ordering Information

Amplifiers

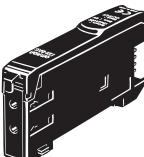
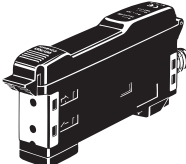
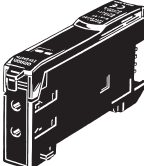
Pre-wired Amplifiers

Type	Appearance	Control output	Model	
			NPN output	PNP output
Standard models		ON/OFF output	E3X-DA11-N 2M	E3X-DA41-N 2M
Monitor-output models		• ON/OFF output • Monitor output	E3X-DA21-N 2M	E3X-DA51-N 2M
Mark-detecting models (blue LED)			E3X-DAB11-N 2M	E3X-DAB41-N 2M
Mark-detecting models (green LED)			E3X-DAG11-N 2M	E3X-DAG41-N 2M
Infrared models			E3X-DAH11-N 2M	E3X-DAH41-N 2M
Differential-output model *1			E3X-DA11D 2M	---
Water-resistant models		ON/OFF output	E3X-DA11V 2M	E3X-DA41V 2M
Twin-output models			E3X-DA11TW 2M *2	E3X-DA41TW 2M *2

*1. For details, refer to page 6.

*2. Manufacturing of the E3X-DA□TW Series was discontinued at the end of March 2012.



Amplifiers with Standard Connectors

Type	Appearance	Applicable Connector (order separately)		Control output	Model	
					NPN output	PNP output
Standard models		Master	E3X-CN11	ON/OFF output	E3X-DA6	E3X-DA8
		Slave	E3X-CN12			
Monitor-output models		Master	E3X-CN21	• ON/OFF output • Monitor output	E3X-DA7	E3X-DA9
		Slave	E3X-CN22			
Mark-detecting models (Blue LED)		Master	E3X-CN11		E3X-DAB6	E3X-DAB8
		Slave	E3X-CN12			
Mark-detecting models (Green LED)		Master	E3X-CN11		E3X-DAG6	E3X-DAG8
		Slave	E3X-CN12			
Infrared models		Master	E3X-CN11		E3X-DAH6	E3X-DAH8
		Slave	E3X-CN12			
Differential-output model *1		Master	E3X-CN11		E3X-DA6D	---
		Slave	E3X-CN12			
Water-resistant models (M8 connector)		XS3F-M421-40□-A XS3F-M422-40□-A		ON/OFF output	E3X-DA14V	E3X-DA44V
		Master	E3X-CN21		E3X-DA6TW *2	E3X-DA8TW *2
Twin-output models		Slave	E3X-CN22			

*1. For details, refer to page 6.

*2. Manufacturing of the E3X-DA□TW Series was discontinued at the end of March 2012.

Amplifier Connectors (Order Separately) Note: Seal provided as accessory.

Type	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 Amplifiers and Connectors (Basically Amplifiers and Connectors are sold separately.)



Refer to the following tables when placing an order.

Amplifiers			Applicable Connectors (Order Separately)	
Type	NPN	PNP	Master Connector	Slave Connector
Standard models	E3X-DA6	E3X-DA8	E3X-CN11	E3X-CN12
Mark-detecting models	E3X-DAB6	E3X-DAB8		
	E3X-DAG6	E3X-DAG8		
Infrared models	E3X-DAH6	E3X-DAH8	E3X-CN21	E3X-CN22
Differential-output model	E3X-DA6D	---		
Monitor-output models	E3X-DA7	E3X-DA9		
Twin-output models	E3X-DA6TW	E3X-DA8TW		





When Using 5 Amplifiers

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

Sensor I/O Connectors (Order Separately)

Size	Cable specifications	Appearance	Cable type		Model
M8	Standard cable	Straight connector 	2 m	4-wire connection	XS3F-M421-402-A
			5 m		XS3F-M421-405-A
		L-shaped connector 	2 m		XS3F-M422-402-A
			5 m		XS3F-M422-405-A

Mobile Console (Order Separately)

Appearance	Model	Remarks
	(model number of set) E3X-MC11	Mobile Console with head, cable, and AC adapter provided as accessories. Power supply method: chargeable battery
	E3X-MC11-C1	Mobile Console
	E3X-MC11-H1	Head
	E39-Z12-1	Cable (1.5 m)

Accessories (Order Separately)**Mounting Brackets**

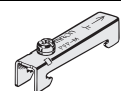
Appearance	Applicable model	Model	Quantity	Remarks
	E3X-DA-N Series	E39-L143	1	---
	E3X-DA□V	E39-L148		

* When using a Through-beam Fiber Unit, order one Bracket for the Receiver and one for the Emitter.

Operating Instructions Sticker

Model	Remarks
E39-Y1	Attach near the Sensor. → Refer to page 25.

End Plate

Appearance	Model	Quantity
	PFP-M	1

Ratings and Specifications

For dimensions, refer to page 26 to 29.

Amplifiers

Pre-wired Amplifiers

Type		Standard models	Monitor-output models	Mark-detecting models		Infrared models	Water-resistant models	Twin-output models	
Item	Output type	NPN output	E3X-DA11-N	E3X-DA21-N	E3X-DAB11-N	E3X-DAG11-N	E3X-DAH11-N	E3X-DA11V	E3X-DA11TW
		PNP output	E3X-DA41-N	E3X-DA51-N	E3X-DAB41-N	E3X-DAG41-N	E3X-DAH41-N	E3X-DA41V	E3X-DA41TW
Light source (wavelength)		Red LED (660 nm)			Blue LED (470 nm)	Green LED (525 nm)	Infrared LED (870 nm)	Red LED (660 nm)	
Power supply voltage		12 to 24 VDC±10%, ripple (p-p) 10% max.							
Power consumption		Normally: 960 mW max. (current consumption: 40 mA max. at power supply voltage of 24 VDC) Eco Mode: 720 mW max. (current consumption: 30 mA max. at power supply voltage of 24 VDC) Digital display not lit: 600 mW max. (current consumption: 25 mA max. at power supply voltage of 24 VDC)							
Control output	ON/OFF output	Load current: 50 mA (residual voltage (NPN/PNP): 1 V max., Open collector (NPN or PNP output, depending on the model) Light ON/Dark ON selectable							
	Monitor output	---	Load 1 to 5 VDC, 10 kΩ min.	---					
Protection circuit		Power supply reverse polarity, Output short-circuit protection, Mutual interference prevention (supported for up to 10 Units)							
Re-sponse time	Super-high-speed mode	0.25 ms for operation and reset respectively							0.5 ms for operation and reset respectively
	Standard mode	1 ms for operation and reset respectively							2 ms for operation and reset
	Super-long-distance mode	4 ms for operation and reset respectively							7 ms for operation and reset respectively
Sensitivity setting		Teaching or manual method							
Functions	Timer function	OFF-delay timer: 0 to 200 ms, 1 to 20 ms (set in 1-ms units); 20 to 200 ms (set in 5-ms units) Using Mobile Console: OFF delay, ON delay, or one shot (selectable)							
	Automatic power control (APC)	Fiber-optic current digital control			---			Fiber-optic current digital control	
	Zero-reset	Negative values can be displayed.							
	Initial reset	Settings can be returned to defaults as required.							
	Monitor focus	---	Upper and lower limits can be set as required for every 100 digital values.	---					
Indicators		Operation indicator (orange), 7-segment digital incident level display (red), 7-segment digital incident level percentage display (red), threshold and excess gain 2-color double bar indicators (green and red), 7-segment digital threshold display (red)							
Display timing		Switching between normal/peak-hold/bottom-hold possible							
Display orientation		Switching between normal/reverse possible							
Optical axis adjustment		Optical axis adjustment possible (hyper-flashing function)							
Ambient illumination (receiver side)		Incandescent lamp: 10,000 lx max. Sunlight: 20,000 lx max.							

Item	Type		Standard models	Monitor-output models	Mark-detecting models		Infrared models	Water-resistant models	Twin-output models
	Output type	NPN output	E3X-DA11-N	E3X-DA21-N	E3X-DAB11-N	E3X-DAG11-N	E3X-DAH11-N	E3X-DA11V	E3X-DA11TW
		PNP output	E3X-DA41-N	E3X-DA51-N	E3X-DAB41-N	E3X-DAG41-N	E3X-DAH41-N	E3X-DA41V	E3X-DA41TW
Ambient temperature		Operating: Groups of 1 to 3 Amplifiers: -25 to 55°C Groups of 4 to 11 Amplifiers: -25 to 50°C Groups of 12 to 16 Amplifiers: -25 to 45°C Storage: -30 to 70°C (with no icing or condensation)							
Ambient humidity		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 min							
Vibration resistance (destruction)		10 to 55 Hz with a 1.5-mm double amplitude for 2 h each in X, Y and Z directions							
Shock resistance (destruction)		500m/s ² , for 3 times each in X, Y and Z directions							
Degree of protection		IEC IP50 (with Protective Cover attached)						IEC IP66 (with Protective Cover attached)	IEC IP50 (with Protective Cover attached)
Connection method		Pre-wired (standard cable length: 2 m)							
Weight (packed state)		Approx. 100 g						Approx. 110 g	Approx. 100 g
Material	Case	Polybutylene terephthalate (PBT)							
	Cover	Polycarbonate							Polyethersulfone
Accessories		Instruction sheet							

Amplifiers with Connectors

(Specifications different to those for Pre-wired Amplifiers)

Item	Type		Standard models	Monitor-output models	Mark-detecting models		Infrared models	Water-resistant models*	Twin-output models
	Output type	NPN output	E3X-DA6	E3X-DA7	E3X-DAB6	E3X-DAG6	E3X-DAH6	E3X-DA14V	E3X-DA6TW
		PNP output	E3X-DA8	E3X-DA9	E3X-DAB8	E3X-DAG8	E3X-DAH8	E3X-DA44V	E3X-DA8TW
Connection method		Standard connector						M8 connector	Standard connector
Weight (packed state)		Approx. 55 g						Approx. 65 g	Approx. 55 g

* The dielectric strength for water-resistant models is 500 VAC at 50/60 Hz for 1 min.

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 and the adjacent Connector. It does not include the conductor resistance of the cable.	
No. of insertions (durability)		50 times The figure for the number of insertions is for connection to the Amplifier and the adjacent Connector.	
Material	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
Power supply voltage		Charged with AC adapter
Connection method		Connected via adapter
Weight (packed state)		Approx. 580 g (Console only: 120 g)
Refer to <i>Instruction Manual</i> provided with the Mobile Console for details.		

Digital Fiber Amplifiers with Differential Outputs (E3X-DA11D/E3X-DA6D)

Characteristics of Applicable Fiber Units

Through-beam Fiber Units

Sensitivity selection 11-level setting Response time Fiber Unit		Sensing distance (mm) (The figures in parentheses apply when using the 39-F1 Lens Unit.)					Standard object (mm) *1 (min. sensing object *2: opaque)	
		HIGH			LOW			
		1	2	3 to 11	1	2		3 to 11
	270 or 570 μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	270 or 570 μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms		
E32-T11R	240 (1680)	280 (1960)	370 (2590)	140 (980)	180 (1260)	240 (1680)	1 dia. (0.01 dia.)	
E32-T21R	50	60	80	30	40	50		
E32-T16WR	580	690	910	350	450	580	(0.3 dia.) *1	
E32-T16PR	380	450	600	230	290	380	(0.2 dia.) *2	

*1. These values are for sensing objects that are moving.

*2. This value applies when the response time is set to 3 to 11. An object of this value is detectable if the temperature changes within the range of ambient operating temperature. (The value is for sensing objects that are moving.)

*3. The values given in the above table are those that can be detected at a digital value of 1,000 in each sensing area.

Reflective Fiber Units

Sensitivity selection 11-level setting Response time Fiber Unit	Sensing distance (mm) *1						Standard object (mm) *2 (min. sensing object *3: opaque)
	HIGH			LOW			
	1	2	3-11	1	2	3-11	
	270 or 570 μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	270 or 570 μs	0.5 or 1 ms	1 to 200 ms or 2 to 400 ms	
E32-D11R	80	90	120	45	60	80	150 × 150 (0.01 dia.)
E32-D21R	13	15	20	7	10	13	25 × 25 (0.01 dia.)

*1. Sensing distances are given for white paper.

*2. These values are for sensing objects that are moving.

*3. This value applies when the response time is set to 3 to 11. An object of this value is detectable if the temperature changes within the range of ambient operating temperature. (The value is for sensing objects that are moving.)

Differences Compared with E3X-DA-N Amplifier

Item		Type	Differential-output Models (Edge-detection Models)	
			Pre-wired	Wire-saving connector
		NPN output		E3X-DA11D
Current consumption			960 mW max. (current consumption: 40 mA max. at power supply voltage of 24 VDC)	
Control output	ON/OFF output	Load current: 50 mA max., (Residual voltage: 1 V max. for NPN/PNP output) Open collector Switchable between Light ON (ON at edge detection) and Dark ON (OFF at edge detection)		
		Detection mode		
Detection mode			Switchable between single edge and double edge detection mode	
Response time			Single edge: Can be set to 270 μs, 500 μs, 1 ms, 2 ms, 4 ms, 10 ms, 20 ms, 30 ms, 50 ms, 100 ms, or 200 ms. Double edge: Can be set to 570 μs, 1 ms, 2 ms, 4 ms, 10 ms, 20 ms, 30 ms, 50 ms, 100 ms, 200 ms or 400 ms.	
Functions	Timer functions	Light ON: OFF-delay timer, Dark ON: ON-delay timer 0 to 5 s (1 to 20 ms: 1-ms units, 20 to 200 ms: 5-ms units, 200 ms to 1 s: 100 ms, 1 to 5 s: 1-s units)		
	APC	Yes		
	Zero-reset	Yes (Negative values can be displayed.)		
	Initial reset	Yes (Settings can be returned to defaults.)		
	Sensitivity selection	Yes (HIGH/LOW)		
	Teaching level	One-point teaching level can be varied from 1% to 50% in increments of 1%		
Indicators			Operation indicator (orange), 7-segment digital incident level display (red), 7-segment digital detection level display (red)	

For other information, refer to the instruction manual supplied with the product.