

# Simple Fiber Amplifier E3X-SD

# The Standard for Fiber Amplifiers with Simple Operation and High Performance

- Operation so simple that essentially anyone can use the amplifier right way.
- Immediately determine operation and amount of light with a simple, bright display.
- General-purpose capabilities to simply handle a broad range of applications.



# **Ordering Information**

#### **Amplifier Units**

**Digital Display and Direct Key Setting** 

		Connection	Ratings and	Model	
Item	Appearance	method	Specifications	NPN output	PNP output
Standard models		Pre-wired		E3X-SD11	E3X-SD41
		Wire-saving connector	_	E3X-SD6	E3X-SD8

#### **Amplifier Unit Connectors (Order Separately)**

Note: Stickers for Connectors are included as accessories.

Item	Appear- ance	Cable length	No. of conductors	Model
Master Connector			3	E3X-CN11
Slave Connector		2 m	1	E3X-CN12

# Combining Amplifier Units and Connectors

(Basically, Amplifier Units and Connectors are sold separately)

Refer to the following tables when placing an order.

Amplifier Units						
Type	NPN	PNP				
Standard models	E3X-SD6	E3X-SD8				

When Using 5 Amplifier Units

5 Amplifier Units

Applicable Connectors (Order Separately)				
Master Connector	Slave Connector			
E3X-CN11 (3-wire)	E3X-CN12 (1-wire)			

1 Master Connector + 4 Slave Connectors

#### Sensor I/O Connectors (Order Separately)

Size	Cable specifications	Appearance		Cable type		Model
	Standard cable	Straight		2 m		XS3F-M421-402-A
M8		connector		5 m	Four- conductor	XS3F-M421-405-A
IVIO	Statiuatu Cable	L-shaped		2 m	cable	XS3F-M422-402-A
		connector		5 m		XS3F-M422-405-A

#### **Accessories (Order Separately)**

#### **Mounting Brackets**

I	Appearance	Applicable models	Model	Quantity
		E3X-SD□	E39-L143	1

#### **End Plate**

Appearance	Model	Quantity
	PFP-M	1

# E3X-SD

# **Ratings and Specifications**

# **Amplifier Units**

Type -		Digital display and direct key setting			
	Type	Standard models			
Item N	Model	E3X-SD□			
Light source (wavelength)		Red LED (620 nm)			
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p): 10% max.			
Current consumption		960 mW max. (Power supply: 24 V, Current consumption: 40 mA max.)			
Control output		Open-collector output (NPN or PNP) Load power supply: 26.4 V max., Load current: 50 mA max. (Residual voltage: 1.5 V max.) Light-ON/Dark-ON mode selector			
Response time		Operate or reset: 200 µs max.			
Sensitivity adjustment		UP/DOWN direct key setting, teaching			
Protection circuits		Power supply reverse polarity protection, output short-circuit protection, output reverse polarity protection			
Timer function		ON/OFF-delay timer: 10 ms (each fixed)			
Mutual interference prevention		Up to 5 Amplifiers (optically synchronized)			
Ambient illumination		Receiver side Incandescent lamp: 10,000 lux max. Sunlight: 20,000 lux max.			
Ambient temperature rang	je	Operating: Groups of 1 to 3 Amplifiers: -25°C to 55°C Groups of 4 to 11 Amplifiers: -25°C to 50°C Groups of 12 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/s², for 3 times each in X, Y and Z directions			
Degree of protection		IEC 60529 IP50 (with Protective Cover attached)			
Connection method		Pre-wired (standard cable length: 2 m), or connector			
Weight (packed state)		Pre-wired model: Approx. 100 g, Model with connector: Approx. 55 g			
Material	e	Polybutylene terephthalate (PBT)			
Cov	er	Polycarbonate			
Accessories		Instruction manual			

<sup>\*</sup> Models with connectors have a dielectric strength of 500 VAC.

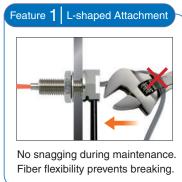
## **Amplifier Unit Connectors**

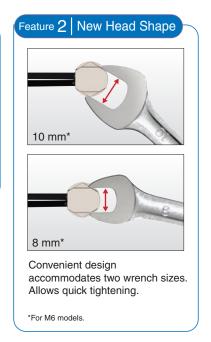
Item	Model	E3X-CN11	
Rated current		2.5 A	
Rated voltage		50 V	
Contact resistance		$20 \text{ m}\Omega$ max. (20 mVDC max., 100 mA max.) (The above figure is for connection to the Amplifier Unit and the adjacent Connector. It does not include the conductor resistance of the cable.)	
Number of inse	rtions	Destruction: 50 times (for connection to the Amplifier Unit and the adjacent Connector)	
Material	Housing	Polybutylene terephthalate (PBT)	
Material	Contact	Phosphor bronze/gold-plated nickel	
Weight (packed	state)	Approx. 55 g	

#### **Fiber Unit Overview**

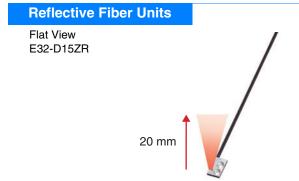
#### No snagging, no breaking: Right-angle (L-shaped) Models



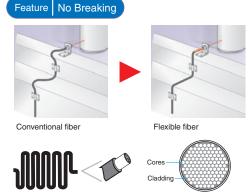




# Flat and flexible fiber models are easy to mount and will not break.

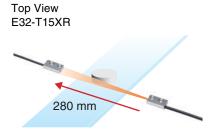


Size:  $15 \times 10 \times 3 \text{ mm}$ 



A large number of ultrafine cores are all surrounded by cladding. As a result, the fiber is flexible and can be bent without significantly reducing the light intensity. This helps solve problems, such as fiber being broken by getting caught on other objects.

## **Through-beam Fiber Units**



Size:  $15 \times 8 \times 3$  mm





## **Sensing Distance**

Through-beam Models (Unit: mm)

nrough-bea		Madal	(Unit: r
уре		Model	E3X-SD□ Standard models
урс		E32-T11R/E32-T12R/E32-T15XR/E32-TC200BR (B4R)	280
		E32-T14LR/E32-T15YR/E32-T15ZR	110
	Flexible	E32-T21R/E32-T22R/E32-T222R/E32-T25XR/	
	(new standard)	E32-TC200FR (F4R)	60
		E32-T24R/E32-T25YR/E32-T25ZR	30
		E32-TC200/E32-T12/E32-T15X/E32-TC200B (B4)	400
Ctondoud		E32-T14L/E32-T15Y/E32-T15Z	240
Standard	Ctondoud	E32-TC200A	
models	Standard		360
		E32-TC200E/E32-T22/E32-T222/E32-T25X/E32-TC200F (F4)	100
		E32-T24/E32-T25Y/E32-T25Z	90
		E32-T11/E32-T12B/E32-T15XB	360
	Break resistant	E32-T21/E32-T221B/E32-T22B	100
		E32-T25XB	75
	Fluorine coating	E32-T11U	360
		E32-T17L	14000
		E32-TC200 + E39-F1	3000
		E32-T11R + E39-F1	2100
		E32-T11 + E39-F1	2000
	Long distance,	E32-T14	1800
	high power	E32-T11L/E32-T12L	700
		E32-T11L + E39-F2	500
		E32-T11R + E39-F2	220
		E32-T11 + E39-F2	360
		E32-T21L/E32-T22L	200
	Ultracompact, ultrafine sleeve		
Special-		E32-T223R	60
beam		E32-T33-S5	20
models		E32-T333-S5	5
		E32-T334-S5	2.5
	Fine beam	E32-T22S	1000
	(narrow vision field)	E32-T24S	700
		E32-T16PR	450
		E32-T16P	600
		E32-T16JR	390
		E32-T16J	520
	Area sensing	E32-T16WR	690
		E32-T16W	920
		E32-T16	1500
		E32-M21	300
		E32-T51	400
		E32-T54	130
		E32-T81R-S	180
	Heat resistant	E32-T61-S + E39-F2	390
		E32-T61-S + E39-F1	3000
		E32-T84S-S	700
		E32-T61-S	300
vironment		E32-T11F	1050
esistive	Chemical	E32-T12F	1600
models	resistant	E32-T14F	200
	resistafit	E32-T51F	700
		E32-T81F-S	350
		E32-T51V	100
		E32-T51V + E39-F1V	600
	Vacuum	E32-T54V	65
	resistant	E32-T54V + E39-F1V	390
		E32-T84SV	250

For information on Fiber Units, refer to the E32 Series Fiber Sensor Best Selection (Cat. No. E354).

Reflective Models (Unit: mm)

		Model	E3X-SD□
Гуре			Standard models
		E32-D11R/E32-D12R/E32-D15XR/E32-DC200BR (B4R)	90
		E32-D14LR	16
	Flexible	E32-D15YR/E32-D15ZR	20
	(new standard)	E32-D211R/E32-D21R/E32-D22R/E32-D25XR/ E32-DC200FR (F4R)	15
		E32-D24R	7
		E32-D25YR/E32-D25ZR	4
		E32-DC200/E32-D15X/E32-DC200B (B4)	150
		E32-D12	120
Standard		E32-D14L	40
models	Standard	E32-D15Y/E32-D15Z	50
	Statidatu	E32-D211/E32-DC200E/E32-D22/E32-D25X/ E32-DC200F (F4)	36
		E32-D24	15
		E32-D25Y/E32-D25Z	10
		E32-D11/E32-D15XB	90
		E32-D21B/E32-D221B	35
	Break resistant	E32-D21/E32-D22B	15
		E32-D25XB	25
	Fluorine coating	E32-D11U	90
	_	E32-D16	40 to 400
	Long distance, high power	E32-D11L	200
		E32-D21L/E32-D22L	50
	Ultracompact,	E32-D33	10
	ultrafine sleeve	E32-D331	1.5
		E32-CC200R	75
		E32-CC200	150
		E32-D32L	80
		E32-C31/E32-D32	40
		E32-C42 + E39-F3A	Spot diameter of 0.1 to 0.6 mm a
		E32-D32 + E39-F3A	Spot diameter of 0.5 to 1 mm at 6 to 15 mm.
Special-		E32-C41 + E39-F3A-5	Spot diameter of 0.1 mm at 7 mm
beam		E32-C31 + E39-F3A-5	Spot diameter of 0.5 mm at 7 mm
models		E32-C41 + E39-F3B	Spot diameter of 0.2 mm at 17 mm
		E32-C31 + E39-F3B	Spot diameter of 0.5 mm at 17 mm
		E32-C31 + E39-F3C	Spot diameter of 4 mm max. at 0 to 20 mm.
	Area sensing	E32-D36P1	75
		E32-R21 + E39-R3 (provided)	10 to 250
	Retro-reflective	E32-R16 + E39-R1 (provided)	150 to 1500
		E32-L25/E32-L25A	3.3
		E32-L24S	0 to 4
	Convergent-	E32-L24L	2 to 6 (center 4)
	reflective	E32-L25L	5.4 to 9 (center 7.2)
		E32-L86	4 to 10
		E32-L16	0 to 15
		E32-D51	120
Environment	Heat resistant	E32-D81R/E32-D61	45
resistive		E32-D73	30
models		E32-D12F	50
HIUUGIS	Chemical resistant	E32-D14F	20

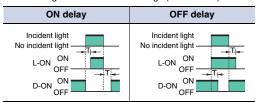
For information on Fiber Units, refer to the E32 Series Fiber Sensor Best Selection (Cat. No. E354).

# E3X-SD

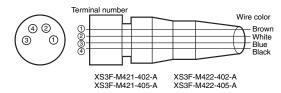
# I/O Circuit Diagrams

Output form	Model	Output transistor operation mode	Timing charts	Operation selector	Output circuit
NPN	E3X-SD11 E3X-SD6	Light-ON	Incident light No incident light Operation Indicator (orange) OFF Output ON transistor OFF Load Operate (relay) Reset (Between brown and black leads)	LIGHT ON (L-ON)	Operation indicator (orange)  Photo-electric Sensor main circuit  Blue  Brown  Load  Load  12 to Sensor main circuit  Blue
Output		Dark-ON	Incident light No incident light Operation On indicator (orange) OFF Output transistor OFF Load Operate (relay) Reset (Between brown and black leads)	DARK ON (D-ON)	M8 Connector Pin Arrangement     Note: Pin 2 is not used.
PNP	E3X-SD41	Light-ON	Incident light No incident light Operation Indicator ON Indicator Overate Output ON Itransistor OFF Load Operate (relay) Reset (Between blue and black leads)	LIGHT ON (L-ON)	Operation indicator (orange) Photo-electric Sensor main circuit
Output	E3X-SD8	Dark-ON	No incident light  No incident light  Operation ON indicator (orange) OFF  Output transistor OFF  Load Operate (relay) Reset  (Between blue and black leads)	DARK ON (D-ON)	M8 Connector Pin Arrangement     Note: Pin 2 is not used.

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



## Plug (Sensor I/O Connector)

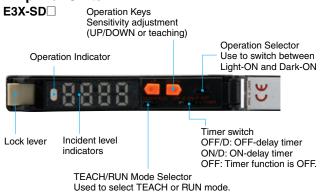


Classification	Wire color	Connection pin	Application
DC	Brown	1	Power supply (+V)
	White	2	
	Blue	3	Power supply (0 V)
	Black	4	Output

Note: Pin 2 is not used.

#### **Nomenclature**

#### **Amplifier Units**



## **Safety Precautions**



This product is not designed or rated for ensuring safety of persons either directly or indirectly.



Do not use it for such purposes.



Do not exceed the rated voltage. Excess voltage may result in malfunction or fire.



Do not use an AC power supply.
Using an AC power supply may result in rupturing.



High-temperature environments may result in burn injury.



#### **Precautions for Safe Use**

The following precautions must be observed to ensure safety.

- 1. Do not use the product in locations where flammable or explosive gas is present.
- 2. Do not use the product in locations subject to splashing water, oil, or chemicals, or in locations subject to steam.
- 3. Do not attempt to disassemble, repair, or modify the product.
- Do not apply voltage or current in excess of the rated ranges.
- 5. Do not use the product in atmospheres or environments that exceed product ratings.
- 6. Do not wire the product incorrectly, such as using incorrect power supply polarity.
- 7. Connect the load properly.
- 8. Do not short-circuit both ends of the load.
- 9. Do not use the product if the case is damaged.
- When disposing of the product, dispose of it as industrial waste.
- 11. Do not use the product in locations subject to direct sunlight.
- 12. The surface temperature of the product may rise as a result of the ambient temperature, power supply, or other usage conditions. Use caution when performing maintenance and washing. Failure to do so may result in burn injury.

#### **Precautions for Correct Use**

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

#### **Amplifier Units**

#### Designing

#### **Communications Hole**

The hole on the side of the Amplifier Unit is a communications hole for preventing mutual interference when Amplifier Units are mounted side-by-side. The E3X-MC11 Mobile Console (order separately) cannot be used.

If an excessive amount of light is received via the Sensor, the mutual interference prevention function may not work. In this case, make the appropriate adjustments using the sensitivity adjuster.

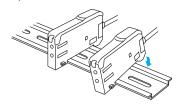
The mutual interference prevention function will not operate when the E3X-SD/NA is used side-by-side with E3X-DA-N models.

#### Mounting

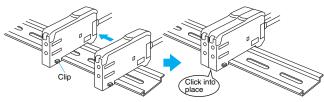
#### **DIN Track Mounting/Removal**

#### **Mounting 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.)

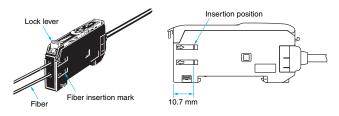
- Note 1. The specifications for ambient temperature will vary according to the number of Amplifier Units used together. For details, refer to *Ratings* and *Specifications*.
  - 2. Always turn OFF the power supply before mounting or removing Amplifier Units.

#### **Fiber Connection and Disconnection**

The E3X Amplifier Unit has a lock lever. Connect or disconnect the fibers to or from the E3X Amplifier Unit using the following procedures:

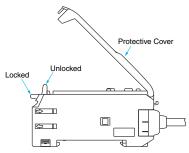
#### 1. Connection

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.



#### 2. Disconnection

Remove the Protective Cover and raise the lock lever to pull out the fiber.



Note:To maintain the fiber properties, confirm that the lock is released before removing the fiber.

#### 3. Precautions for Fiber Connection/Disconnection

Be sure to lock or unlock the lock lever within an ambient temperature range between  $-10^{\circ}$ C and  $40^{\circ}$ C.

#### Operating Environment

#### **Ambient Conditions**

If dust or dirt adhere to the hole for optical communications, it may prevent normal communications. Be sure to remove any dust or dirt before using the Units.

#### Other

#### **Protective Cover**

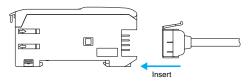
Be sure to mount the Protective Cover before use.

#### **Amplifier Units with Connectors**

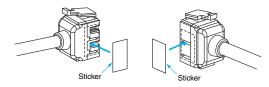
#### Mounting

#### **Mounting Connectors**

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



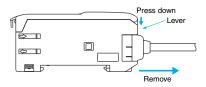
- 2. Join Amplifier Units together as required after all the Master and Slave Connectors have been inserted.
- Attach the stickers (provided as accessories) to the sides of Master and Slave Connectors that are not connected to other Connectors.



Note: Attach the stickers to the sides with grooves.

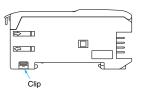
#### **Removing Connectors**

- 1. Slide the slave Amplifier Unit for which the Connector is to be removed away from the rest of the group.
- After the Amplifier Unit 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.)



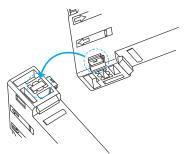
#### **Mounting End Plate (PFP-M)**

Depending on how it is mounted, an Amplifier Unit may move during operation. In this case, use an End Plate. Before mounting an End Plate, remove the clip from the master Amplifier Unit using a nipper or similar tool.

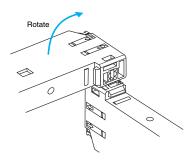


The clip can also be removed using the following mechanism, which is incorporated in the construction of the section underneath the clip.

1. Insert the clip to be removed into the slit underneath the clip on another Amplifier Unit.



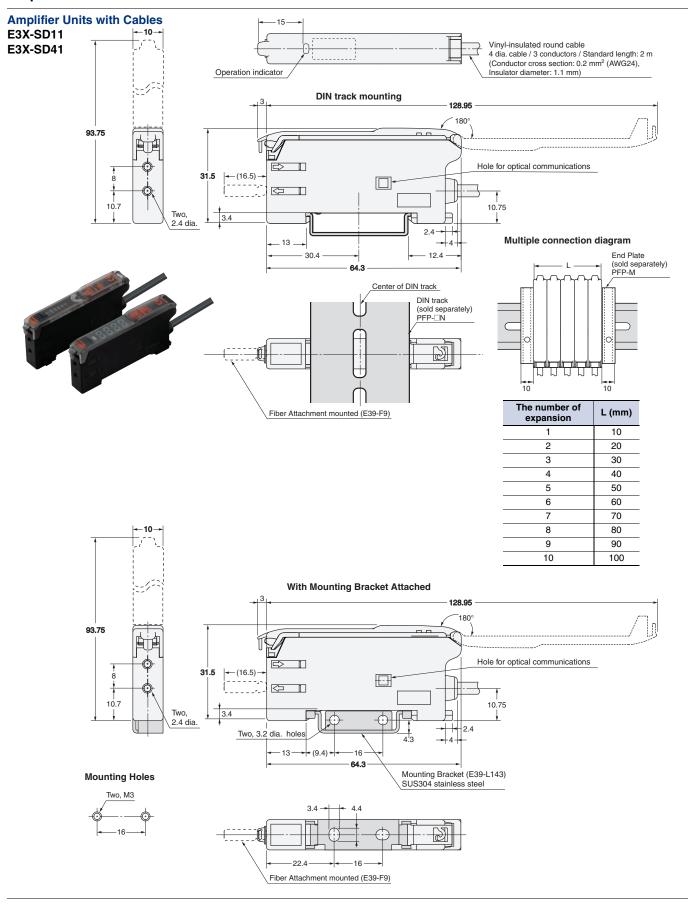
2. Remove the clip by rotating the Amplifier Unit.

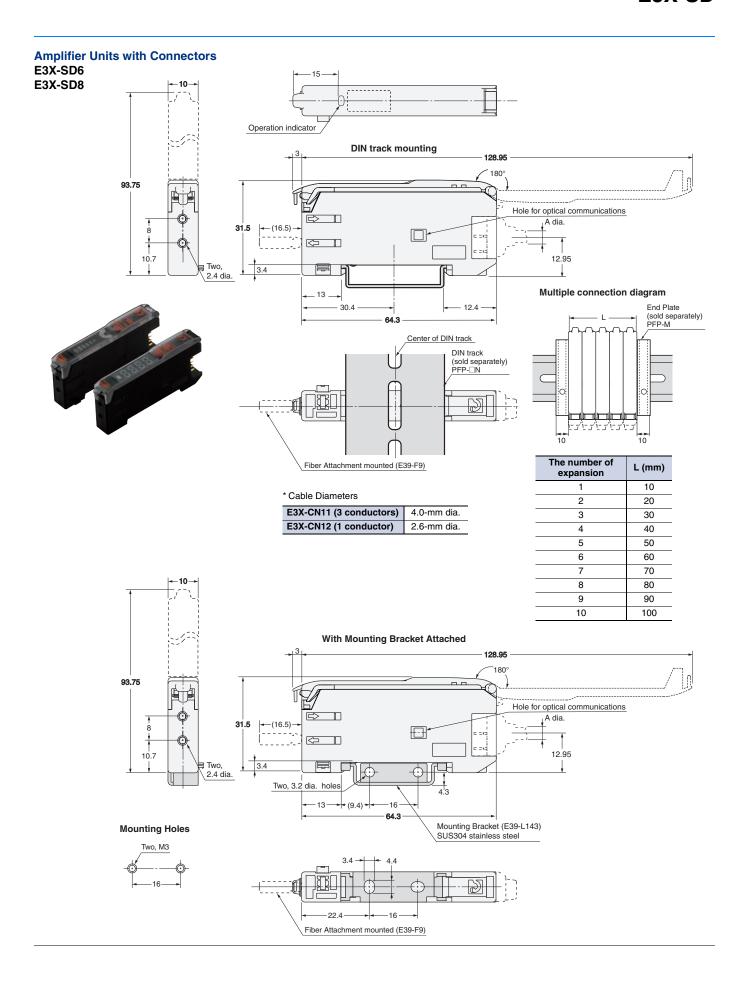


#### **Pull Strengths for Connectors (Including Cables)**

E3X-CN11: 30 N max. E3X-CN12: 12 N max. Dimensions (Unit: mm)

#### **Amplifier Units**

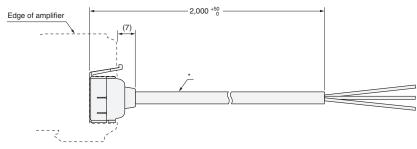




#### **Amplifier Unit Connectors**

# Master Connector E3X-CN11

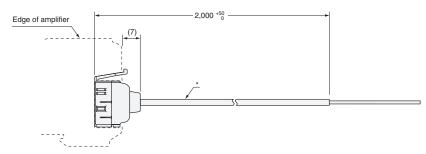




\* E3X-CN11: 4 dia, cable / 3 conductors / Standard length: 2 m (Conductor cross section: 0.2 mm2 (AWG24), Insulator diameter: 1.1 mm)

#### Slave Connector E3X-CN12





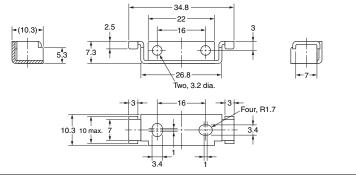
 $^{*} \ E3X-CN12; \textbf{2.6 dia.} \ cable \ / \ \textbf{1 conductor} \ / \ Standard \ length: 2 \ m \ (Conductor \ cross \ section: 0.2 \ mm^{2} \ (AWG24), \ Insulator \ diameter: 1.1 \ mm)$ 

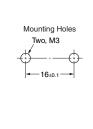
## **Accessories (Order Separately)**

# **Mounting Brackets** E39-L143



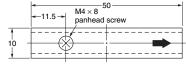
Material: Stainless steel (SUS304)

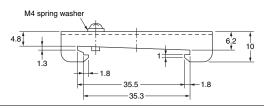




# End Plates PFP-M







For information on Fiber Units, refer to the E32 Series Fiber Sensor Best Selection (Cat. No. E353).

## **Operating Procedure**

#### E3X-SD□

#### 1 Displays

A 7-segment display showing excess gain is provided in addition to the orange operation indicator.

Use these when adjusting the light axis and setting the sensitivity at setup.

Display/indicator status (for L/ON)	Excess gain	Description
Operation indicator  Excess gain display	999% (10 times)	110% min. Stable incident light
•8888	100%	90% to 110% Unstable incident light or Unstable interrupted light
•8888	0%	90% max. Stable interrupted light

#### 2 Sensitivity Setting

The sensitivity can be set with the UP and DOWN Keys similar to using an adjuster knob. The sensitivity can also be easily set by using the following three teaching functions.

#### 2-1. Maximum Sensitivity Setting

The sensitivity can be set to the maximum. This is the optimal setting for resistance against the effects of dust.

Operation description	Switch/Key	Display
Set the TEACH/RUN selector switch to TEACH.	TEACH RUN	0 <u>EEch</u> ◆► 0 (039
Press the UP Key for 3 s min.	UP	OFUL
Set the TEACH/RUN selector switch to RUN (start of measurement).	TEACH RUN	0 run > 0183P

#### 2-2. Teaching with/without a Workpiece

Two points (one with the workpiece and the other without) are detected, and the operating level is set to the midpoint.

Operation description	Switch/Key	Display
Set the TEACH/RUN selector switch to TEACH.	TEACH RUN	0 <u>EEch</u> ◆► 0 (03P
Press the UP Key with the workpiece present.	UP	0
Press the UP Key with the workpiece not present.	UP	ozpaŁ
Set the TEACH/RUN selector switch to RUN (start of measurement).	TEACH RUN	0 - Un > 0 (Q3P

#### 2-3. Automatic Teaching

Changes within a time are detected, and the operating level is set to the midpoint between the maximum and the minimum values of the changes. This setting is optimal for when the workpieces cannot be stopped.

Operation description	Switch/Key	Display
Set the TEACH/RUN selector switch to TEACH.	TEACH RUN	0 <u>Ech</u> ◆ 0 103P
Press the UP Key.	UP	0
Hold down the UP Key during detection. Let the workpiece pass while the key is held down.	UP	ORULO
Set the TEACH/RUN selector switch to RUN (start of measurement).	TEACH RUN	0 run > 0 (038

ME	EMO

#### **READ AND UNDERSTAND THIS DOCUMENT**

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

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