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

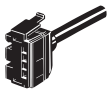
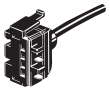
Amplifier Units

Digital Display and Direct Key Setting

Item	Appearance	Connection method	Ratings and Specifications	Model	
				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		2 m	3	E3X-CN11
Slave Connector			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			+	Applicable Connectors (Order Separately)	
Type	NPN	PNP		Master Connector	Slave Connector
Standard models	E3X-SD6	E3X-SD8		E3X-CN11 (3-wire)	E3X-CN12 (1-wire)

When Using 5 Amplifier Units

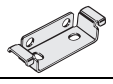
5 Amplifier Units	+	1 Master Connector + 4 Slave Connectors

Sensor I/O Connectors (Order Separately)

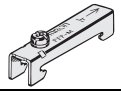
Size	Cable specifications	Appearance	Cable type		Model
M8	Standard cable	Straight connector 	2 m	Four-conductor cable	**XS3F-M421-402-A**
			5 m		**XS3F-M421-405-A**
		L-shaped connector 	2 m		**XS3F-M422-402-A**
			5 m		**XS3F-M422-405-A**

Accessories (Order Separately)

Mounting Brackets

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

Item \ Type		Digital display and direct key setting
		Standard models
Item \ 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 range		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/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 (standard cable length: 2 m), or connector
Weight (packed state)		Pre-wired model: Approx. 100 g, Model with connector: Approx. 55 g
Material	Case	Polybutylene terephthalate (PBT)
	Cover	Polycarbonate
Accessories		Instruction manual

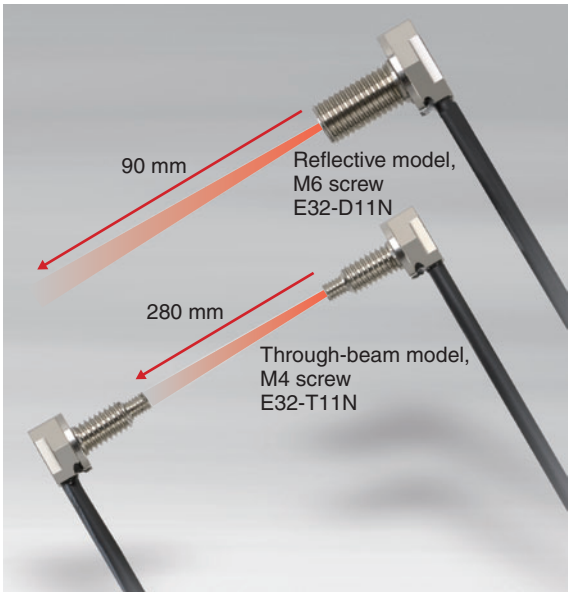
* Models with connectors have a dielectric strength of 500 VAC.

Amplifier Unit Connectors

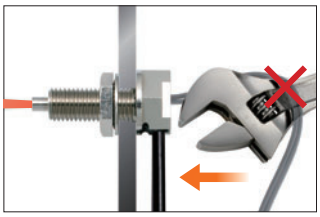
Item \ Model		E3X-CN11
Rated current		2.5 A
Rated voltage		50 V
Contact resistance		20 mΩ max. (20 mVDC max., 100 mA max.) (The above figure is for connection to the Amplifier Unit and the adjacent Connector. It does not include the conductor resistance of the cable.)
Number of insertions		Destruction: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

Fiber Unit Overview

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

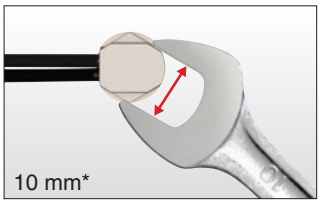


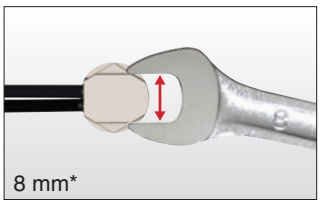
Feature 1 | L-shaped Attachment



No snagging during maintenance.
Fiber flexibility prevents breaking.

Feature 2 | New Head Shape





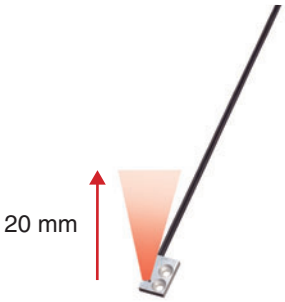
Convenient design accommodates two wrench sizes. Allows quick tightening.

*For M6 models.

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

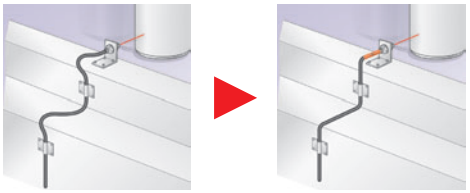
Reflective Fiber Units

Flat View
E32-D15ZR



Size: 15 × 10 × 3 mm

Feature | No Breaking

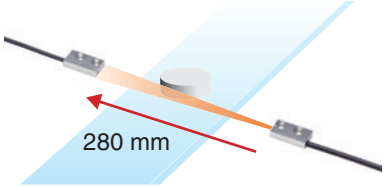


Conventional fiber　　Flexible fiber

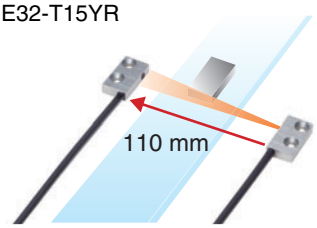
A large number of ultrafine cores are all surrounded by cladding. As a result, the fiber is flexible and can be bent without significantly reducing the light intensity. This helps solve problems, such as fiber being broken by getting caught on other objects.

Through-beam Fiber Units

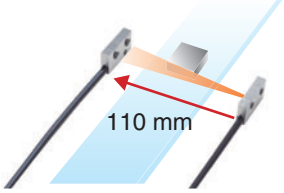
Top View
E32-T15XR



Side View
E32-T15YR



Flat View
E32-T15ZR



Size: 15 × 8 × 3 mm

Sensing Distance

Through-beam Models

(Unit: mm)

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

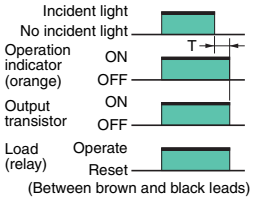
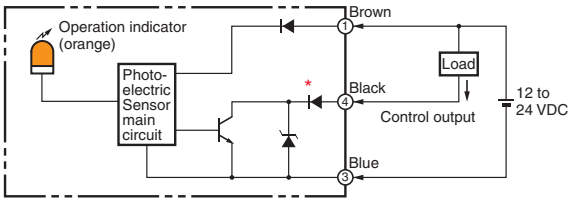
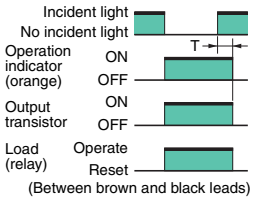
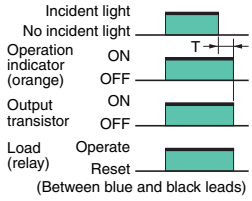
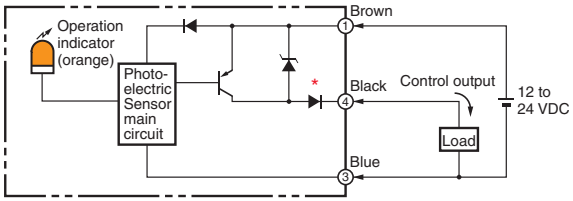
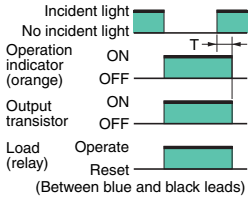
Reflective Models **(Unit: mm)**

Type		Model	E3X-SD□ Standard models
Standard models	Flexible (new standard)	E32-D11R/E32-D12R/E32-D15XR/E32-DC200BR (B4R)	90
		E32-D14LR	16
		E32-D15YR/E32-D15ZR	20
		E32-D211R/E32-D21R/E32-D22R/E32-D25XR/ E32-DC200FR (F4R)	15
		E32-D24R	7
		E32-D25YR/E32-D25ZR	4
	Standard	E32-DC200/E32-D15X/E32-DC200B (B4)	150
		E32-D12	120
		E32-D14L	40
		E32-D15Y/E32-D15Z	50
		E32-D211/E32-DC200E/E32-D22/E32-D25X/ E32-DC200F (F4)	36
		E32-D24	15
		E32-D25Y/E32-D25Z	10
	Break resistant	E32-D11/E32-D15XB	90
		E32-D21B/E32-D221B	35
		E32-D21/E32-D22B	15
		E32-D25XB	25
	Fluorine coating	E32-D11U	90
Special-beam models	Long distance, high power	E32-D16	40 to 400
		E32-D11L	200
		E32-D21L/E32-D22L	50
	Ultracompact, ultrafine sleeve	E32-D33	10
		E32-D331	1.5
	Coaxial, small spot	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 at 6 to 15 mm.
		E32-D32 + E39-F3A	Spot diameter of 0.5 to 1 mm at 6 to 15 mm.
		E32-C41 + E39-F3A-5	Spot diameter of 0.1 mm at 7 mm.
		E32-C31 + E39-F3A-5	Spot diameter of 0.5 mm at 7 mm.
		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
	Retro-reflective	E32-R21 + E39-R3 (provided)	10 to 250
		E32-R16 + E39-R1 (provided)	150 to 1500
	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
Environment resistive models	Heat resistant	E32-D51	120
		E32-D81R/E32-D61	45
		E32-D73	30
	Chemical resistant	E32-D12F	50
		E32-D14F	20

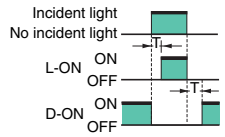
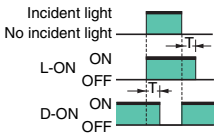
For information on Fiber Units, refer to the *E32 Series Fiber Sensor Best Selection* (Cat. No. E354).

E3X-SD

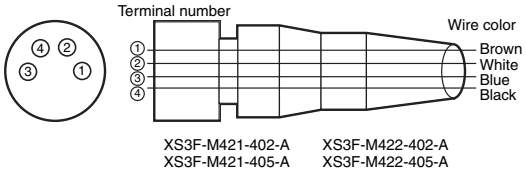
I/O Circuit Diagrams

Output form	Model	Output transistor operation mode	Timing charts	Operation selector	Output circuit
NPN Output	E3X-SD11 E3X-SD6	Light-ON		LIGHT ON (L-ON)	 • M8 Connector Pin Arrangement  Note: Pin 2 is not used.
		Dark-ON		DARK ON (D-ON)	
PNP Output	E3X-SD41 E3X-SD8	Light-ON		LIGHT ON (L-ON)	 • M8 Connector Pin Arrangement  Note: Pin 2 is not used.
		Dark-ON		DARK ON (D-ON)	

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

ON delay	OFF delay
	

Plug (Sensor I/O Connector)



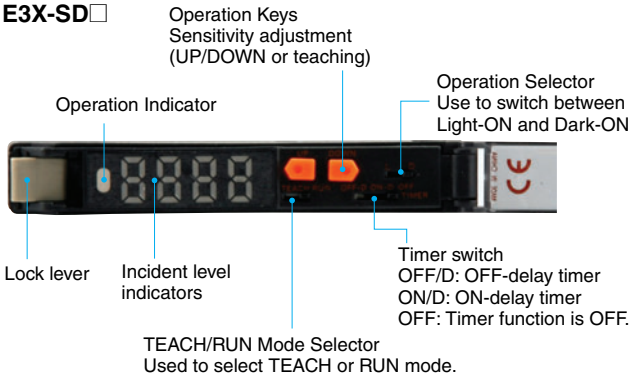
Classification	Wire color	Connection pin	Application
DC	Brown	1	Power supply (+V)
	White	2	---
	Blue	3	Power supply (0 V)
	Black	4	Output

Note: Pin 2 is not used.

Nomenclature

Amplifier Units

E3X-SD□



Safety Precautions

⚠ WARNING

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

⚠ Caution

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.
4. 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.
10. 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.

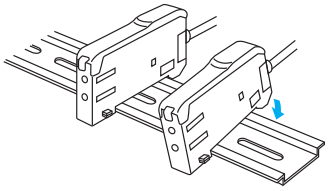
The mutual interference prevention function will not operate when the E3X-SD/NA is used side-by-side with E3X-DA-N models.

● Mounting

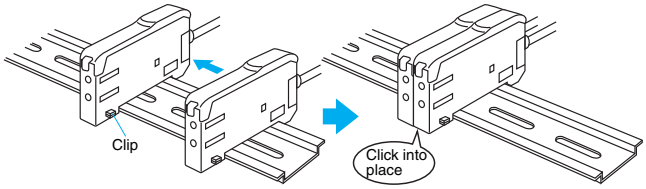
DIN Track Mounting/Removal

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.)

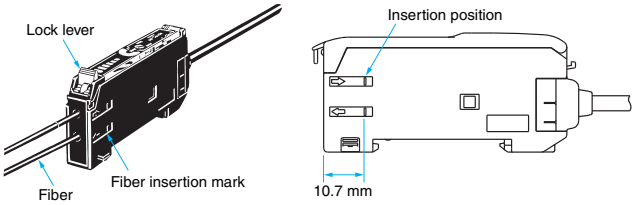
Note 1. The specifications for ambient temperature will vary according to the number of Amplifier Units used together. For details, refer to *Ratings and Specifications*.
2. Always turn OFF the power supply before mounting or removing Amplifier Units.

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:

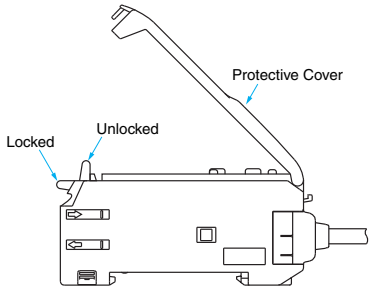
1. Connection

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°C and 40°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

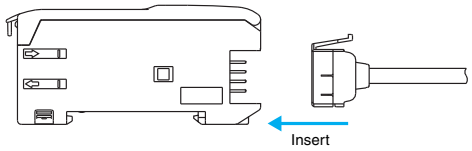
Be sure to mount the Protective Cover before use.

Amplifier Units with Connectors

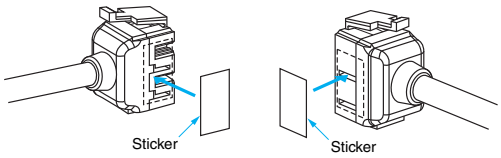
● Mounting

Mounting Connectors

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



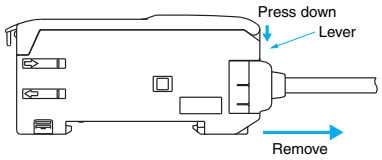
2. Join Amplifier Units together as required after all the Master and Slave Connectors have been inserted.
3. Attach the stickers (provided as accessories) to the sides of Master and Slave Connectors that are not connected to other Connectors.



Note: Attach the stickers to the sides with grooves.

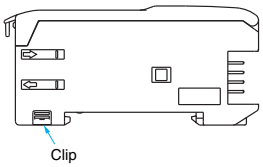
Removing Connectors

1. Slide the slave Amplifier Unit for which the Connector is to be removed away from the rest of the group.
2. 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.)



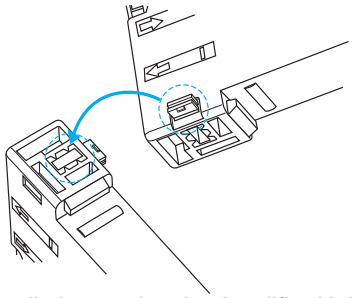
Mounting End Plate (PFP-M)

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.

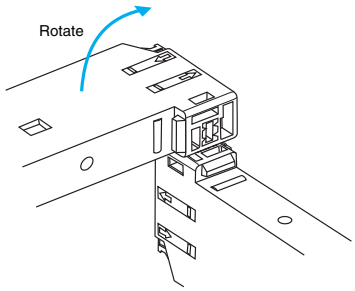


The clip can also be removed using the following mechanism, which is incorporated in the construction of the section underneath the clip.

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.

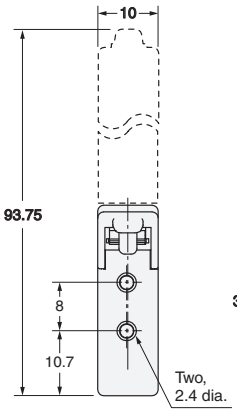
Dimensions

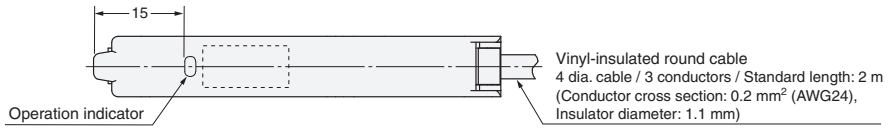
(Unit: mm)

Amplifier Units

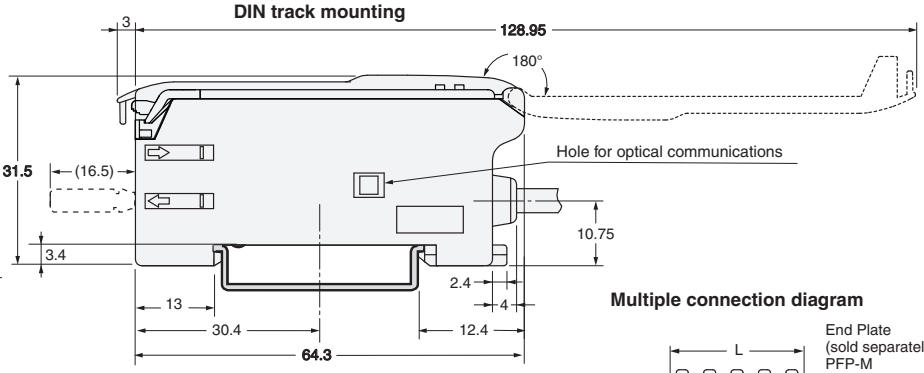
Amplifier Units with Cables

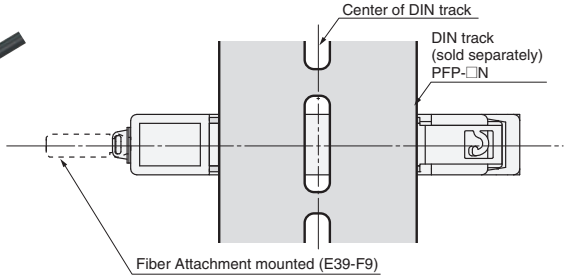
E3X-SD11
E3X-SD41



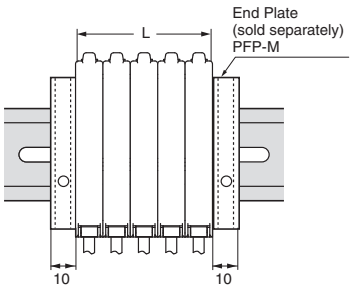


DIN track mounting

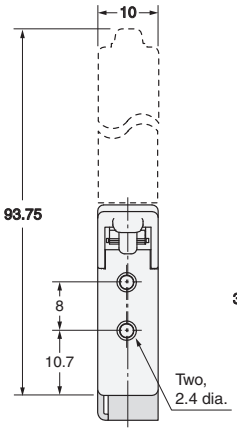




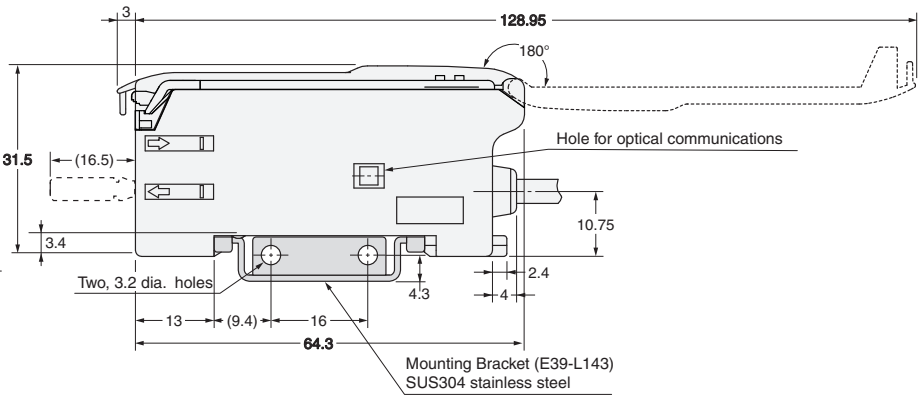
Multiple connection diagram



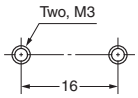
The number of expansion	L (mm)
1	10
2	20
3	30
4	40
5	50
6	60
7	70
8	80
9	90
10	100

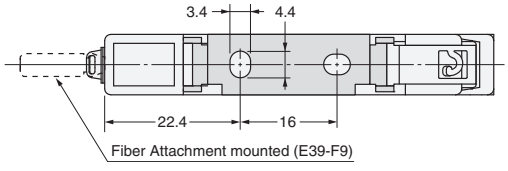


With Mounting Bracket Attached



Mounting Holes





Amplifier Units with Connectors

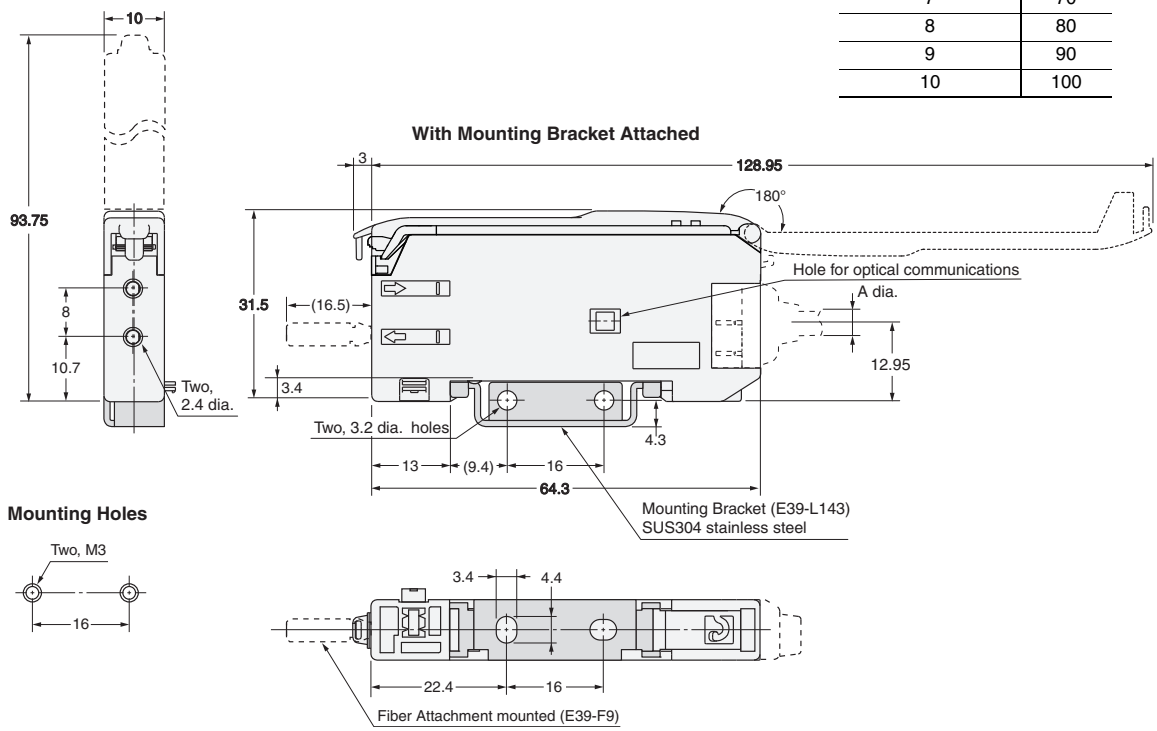
E3X-SD6
E3X-SD8

Multiple connection diagram

The number of expansion	L (mm)
1	10
2	20
3	30
4	40
5	50
6	60
7	70
8	80
9	90
10	100

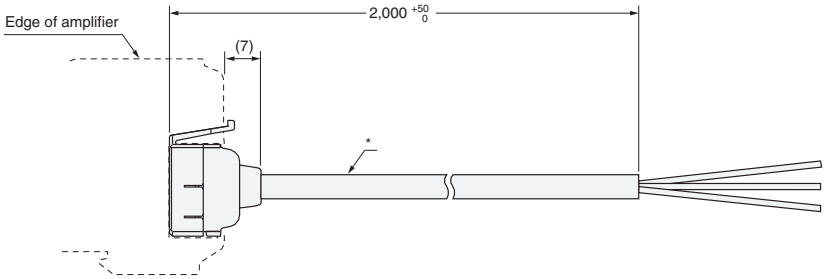
* Cable Diameters

E3X-CN11 (3 conductors)	4.0-mm dia.
E3X-CN12 (1 conductor)	2.6-mm dia.



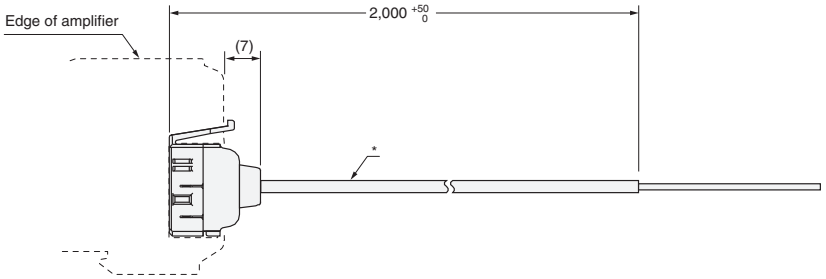
Amplifier Unit Connectors

Master Connector
E3X-CN11



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

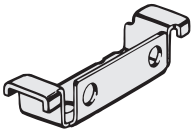
Slave Connector
E3X-CN12



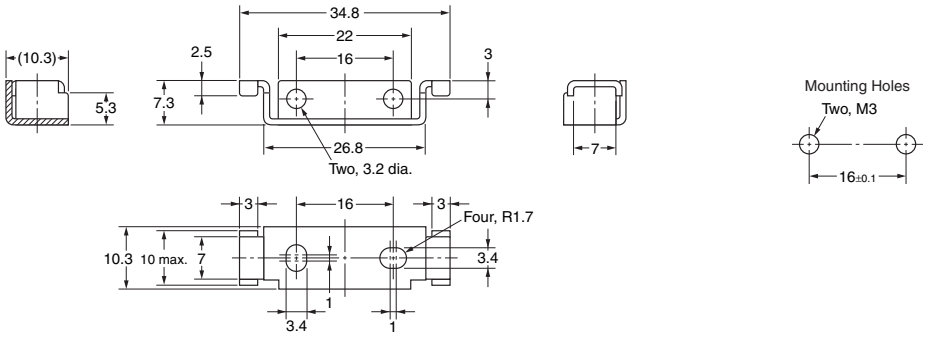
* E3X-CN12: **2.6 dia.** cable / **1 conductor** / Standard length: 2 m (Conductor cross section: 0.2 mm^2 (AWG24), Insulator diameter: 1.1 mm)

Accessories (Order Separately)

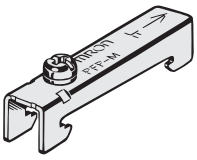
Mounting Brackets
E39-L143

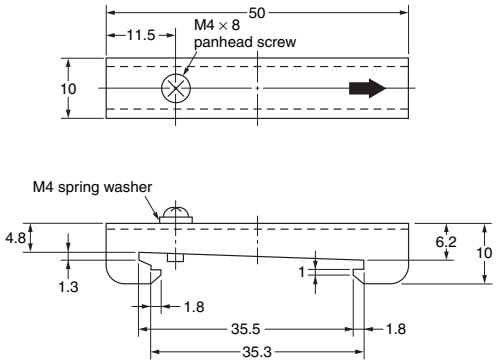


Material: Stainless steel (SUS304)



End Plates
PFP-M





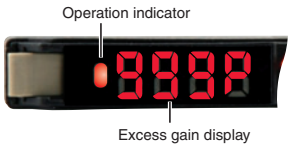
For information on Fiber Units, refer to the *E32 Series Fiber Sensor Best Selection* (Cat. No. E353).

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
	999% (10 times)	110% min. Stable incident light
	100%	90% to 110% Unstable incident light or Unstable interrupted light
	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	
Press the UP Key for 3 s min.	UP	
Set the TEACH/RUN selector switch to RUN (start of measurement).	TEACH RUN	

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	
Press the UP Key with the workpiece present.	UP	
Press the UP Key with the workpiece not present.	UP	
Set the TEACH/RUN selector switch to RUN (start of measurement).	TEACH RUN	

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	
Press the UP Key.	UP	
Hold down the UP Key during detection. Let the workpiece pass while the key is held down.	UP	
Set the TEACH/RUN selector switch to RUN (start of measurement).	TEACH RUN	

MEMO

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