

Simple and Easy-to-Use Amplifiers with a Sensitivity Adjuster Provided as a Standard Feature

- Intuitive LED bar display shows light levels at a glance.
- Utilizes OMRON's innovative wire-saving connector.
- Reduced wiring and space requirements for power lines.
- Optical communications prevents mutual interference for up to 5 amplifiers
- High-speed detection, mark-detecting, and water-resistant models also available.



CE



Be sure to read *Safety Precautions* on page 10.

Ordering Information

Amplifier Units

Amplifier Units with Cables (2m)

Item	Appearance	Control output	Model	
			NPN output	PNP output
Standard models		ON/OFF output	E3X-NA11 2M	E3X-NA41 2M
With self-diagnosis function			E3X-NA21 2M	E3X-NA51 2M
High-speed detection models			E3X-NA11F 2M	E3X-NA41F 2M
Mark-detecting models			E3X-NAG11 2M	E3X-NAG41 2M
Water-resistant models			E3X-NA11V 2M	E3X-NA41V 2M

Amplifier Units with Connectors

Item	Appearance	Applicable Connector (order separately)		Control output	Model	
					NPN output	PNP output
Standard models		Master	E3X-CN11	ON/OFF output	E3X-NA6	E3X-NA8
		Slave	E3X-CN12			
Water-resistant models (M8 connectors)		XS3F-M421-40□-A XS3F-M422-40□-A			E3X-NA14V	E3X-NA44V

Amplifier Unit Connectors (Order Separately) Note: Stickers for Connectors are included as accessories.

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

Combining Amplifier Units and Connectors

Refer to the following tables when placing an order.

Basically, Amplifier Units and Connectors are sold separately.

Amplifier Units			+	Applicable Connectors (Order Separately)	
Type	NPN	PNP		Master Connector	Slave Connector
Standard models	E3X-NA6	E3X-NA8		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

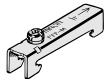
Note: Refer to *Introduction to Sensor I/O Connectors* for details.

Accessories (Order Separately)

Mounting Brackets

Appearance	Applicable models	Model	Quantity
	E3X-NA□ E3X-NA□F E3X-NAG□	E39-L143	1
	E3X-NA□V	E39-L148	

End Plate

Appearance	Model	Quantity
	PFP-M	1

Ratings and Specifications

Amplifier Units

Item	Type		Standard models		High-speed detection models	Mark-detecting models	Water-resistant models
	Model	NPN output	E3X-NA□		E3X-NA□F	E3X-NAG□	E3X-NA□V
		PNP output					
Light source (wavelength)			Red LED (680 nm)			Green LED (520 nm)	Red LED (680 nm)
Power supply voltage			12 to 24 VDC ±10%, ripple (p-p): 10% max.				
Current consumption			35 mA max.		35 mA max. (for 24-VDC power supply)	35 mA max.	
Control output			Load current: 50 mA max.; residual voltage: 1 V max.; NPN/PNP (depends on model) open collector; Light-ON/Dark-ON mode selector				
Self-diagnosis output			None	Yes	None		
Response time			Operate or reset: 200 μs max. *1		Operate: 20 μs max. Reset: 30 μs max.	Operate or reset: 200 μs max. *1	
Sensitivity adjustment			8-turn sensitivity adjuster (with indicator)				
Protection circuits			Reverse polarity, output short-circuit, mutual interference prevention (optically synchronized) *2				
Timer function			OFF-delay timer: 40 ms (fixed)				
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 to11 Amplifiers: −25°C to 50°C Groups of 12 to16 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 *3				
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)				IEC 60529 IP66 (with Protective Cover attached)
Connection method			Pre-wired (standard cable length: 2 m) or connector				
Weight (packed state)			Pre-wired models: approx. 100 g, Connector models: approx. 55 g (See note 4.) *4				
Material	Case	Polybutylene terephthalate (PBT)					
	Cover	Polycarbonate					Polyethersulfone (PES)
Accessories			Instruction manual				

*1. When there are 8 or more Units mounted side-by-side, the response time will be 350 μs max.

*2. High-speed detection models do not have the mutual interference prevention function.

*3. The dielectric strength for water-resistant models with M8 connectors is 500 VAC.

*4. Add 10 g to the weight for water-resistant models.

Amplifier Unit Connectors

Item	Model	E3X-CN11	E3X-CN12
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	Approx. 25 g

**Sensing Distance
Through-beam Models**

(Unit: mm)

Type		Model	E3X-NA□	E3X-NA□F
			General-purpose models	High-speed models
Standard models	Flexible (new standard)	E32-T11R/E32-T12R/E32-T15XR/E32-TC200BR(B4R)	280	80
		E32-T14LR/E32-T15YR/E32-T15ZR	110	33
		E32-T21R/E32-T22R/E32-T222R/E32-T25XR/ E32-TC200FR(F4R)	60	18
		E32-T24R/E32-T25YR/E32-T25ZR	30	9
	Standard	E32-TC200/E32-T12/E32-T15X/E32-TC200B(B4)	400	120
		E32-T14L/E32-T15Y/E32-T15Z	240	70
		E32-TC200A	360	100
		E32-TC200E/E32-T22/E32-T222/E32-T25X/E32-TC200F(F4)	100	30
		E32-T24/E32-T25Y/E32-T25Z	90	27
	Break resistant	E32-T11/E32-T12B/E32-T15XB	360	100
		E32-T21/E32-T221B/E32-T22B	100	30
		E32-T25XB	75	20
	Fluorine coating	E32-T11U	360	100
Special-beam models	Long distance, high power	E32-T17L	14000	4200
		E32-TC200 + E39-F1	3000	900
		E32-T11R + E39-F1	2100	630
		E32-T11 + E39-F1	2000	600
		E32-T14	1800	540
		E32-T11L/E32-T12L	700	210
		E32-T11L + E39-F2	500	150
		E32-T11R + E39-F2	220	65
		E32-T11 + E39-F2	360	100
		E32-T21L/E32-T22L	200	60
	Ultracompact, ultrafine sleeve	E32-T223R	60	18
		E32-T33-S5	20	6
		E32-T333-S5	5	1.5
		E32-T334-S5	2.5	0.8
	Fine beam (nar- row vision field)	E32-T22S	1000	300
		E32-T24S	700	210
	Area sensing	E32-T16PR	450	130
		E32-T16P	600	180
		E32-T16JR	390	110
		E32-T16J	520	150
		E32-T16WR	690	200
		E32-T16W	920	270
		E32-T16	1500	450
		E32-M21	300	90
		E32-T51	400	120
Environment- resistive models	Heat resistant	E32-T54	130	35
		E32-T81R-S	180	50
		E32-T61-S + E39-F2	390	130
		E32-T61-S + E39-F1	3000	900
		E32-T84S-S	700	210
		E32-T61-S	300	90
		E32-T11F	1050	380
	Chemical resistant	E32-T12F	1600	480
		E32-T14F	200	60
		E32-T51F	700	200
		E32-T81F-S	350	100
		E32-T51V	100	---
	Vacuum resistant	E32-T51V + E39-F1V	600	---
		E32-T54V	65	---
		E32-T54V + E39-F1V	390	---
		E32-T84SV	250	---

Reflective Models

(Unit: mm)

Type		Model	E3X-NA□	E3X-NA□F
			General-purpose models	High-speed models
Standard models	Flexible (new standard)	E32-D11R/E32-D12R/E32-D15XR/E32-DC200BR(B4R)	90	30
		E32-D14LR	16	5
		E32-D15YR/E32-D15ZR	20	5
		E32-D211R/E32-D21R/E32-D22R/E32-D25XR/E32-DC200FR(F4R)	15	5
		E32-D24R	7	2.3
		E32-D25YR/E32-D25ZR	4	1.2
	Standard	E32-DC200/E32-D15X/E32-DC200B(B4)	150	50
		E32-D12	120	40
		E32-D14L	40	13
		E32-D15Y/E32-D15Z	50	15
		E32-D211/E32-DC200E/E32-D22/E32-D25X/E32-DC200F(F4)	36	12
		E32-D24	15	5
		E32-D25Y/E32-D25Z	10	3.3
	Break resistant	E32-D11/E32-D15XB	90	30
		E32-D21B/E32-D221B	35	10
		E32-D21/E32-D22B	15	5
		E32-D25XB	25	8
	Fluorine coating	E32-D11U	90	30
Special-beam models	Long distance, high power	E32-D16	40 to 400	55 to 70
		E32-D11L	200	65
		E32-D21L/E32-D22L	50	17
	Ultracompact, ultrafine sleeve	E32-D33	10	3.3
		E32-D331	1.5	0.5
	Coaxial, small spot	E32-CC200R	75	25
		E32-CC200	150	50
		E32-D32L	80	25
		E32-C31/E32-D32	40	13
		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	25
	Retro-reflective	E32-R21 + E39-R3 (provided)	10 to 250	
		E32-R16 + E39-R1 (provided)	150 to 1500	150 to 1000
	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 13
Environment-resistant models	Heat resistant	E32-D51	120	40
		E32-D81R/E32-D61	45	15
		E32-D73	30	10
	Chemical resistant	E32-D12F	50	16
		E32-D14F	20	6.5

Application-specific Models

(Unit: mm)

Type		Model	E3X-NA□	E3X-NA□F
			General-purpose models	High-speed models
Application-specific Models	Label detection	E32-G14	10	
		E32-T14	1800	540
	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 diameter restrictions)	
		E32-D82F1(F2)	Liquid-contact model	

Green Light Source Models

(Unit: mm)

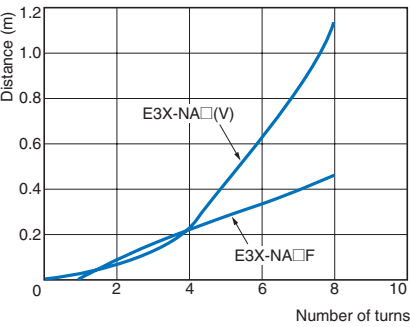
Type		Model	E3X-NAG□
			Mark-detecting Models
Through-beam models	Standard	E32-T11R/E32-T12R/E32-T15XR/E32-TC200BR(B4R)	50
		E32-T14LR/E32-T15YR/E32-T15ZR	20
		E32-TC200/E32-T12/E32-T15X/E32-TC200B(B4)	75
		E32-T14L/E32-T15Y/E32-T15Z	45
	Special beam	E32-T11L/E32-T12L	130
Reflective	Standard	E32-D11R/E32-D12R/E32-D15XR/E32-DC200BR(B4R)	15
		E32-D14LR	3.5
		E32-D15YR/E32-D15ZR	3.3
		E32-DC200/E32-D15X/E32-DC200B(B4)	25
		E32-D14L	10
		E32-D15Y/E32-D15Z	8
	Special beam	E32-D11L	35
		E32-CC200R	12
		E32-CC200	25
		E32-D32L	12
		E32-C31/E32-D32	6
Application specific	Label detection	E32-T14	330
		E32-G14	10

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

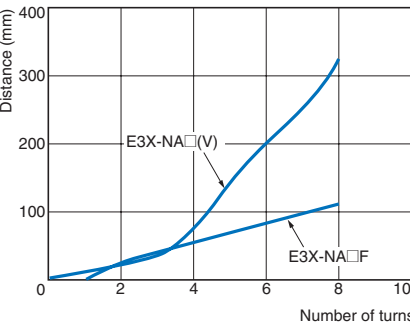
Engineering Data (Typical)

Number of Turns of Sensitivity Adjuster vs. Sensing Distance

E32-T11L

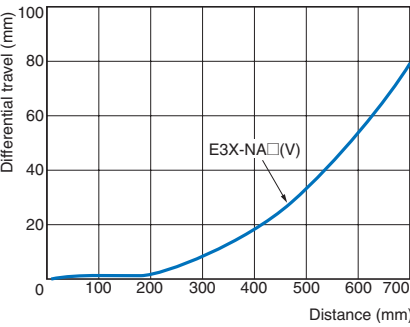


E32-D11L

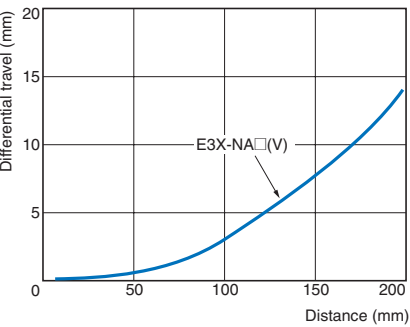


Sensing Distance vs. Differential Travel

E32-T11L

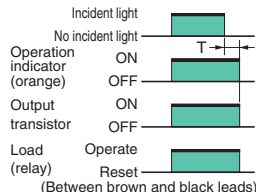
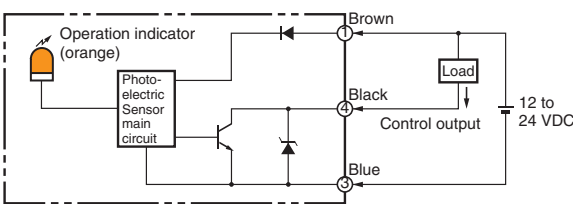
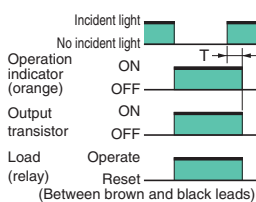
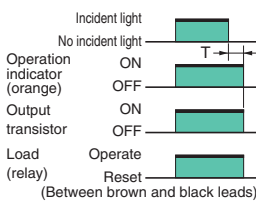
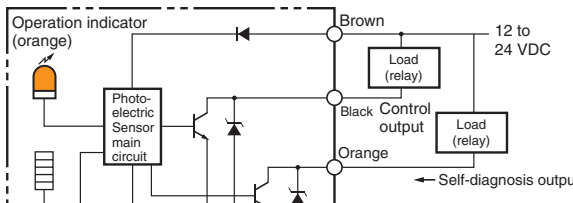
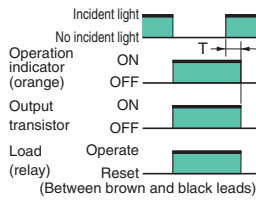
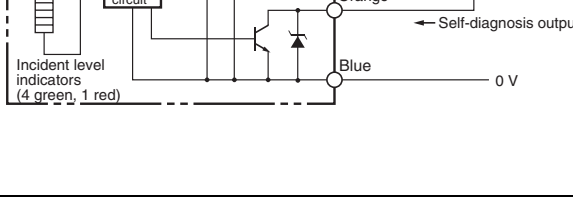


E32-D11L



I/O Circuit Diagrams

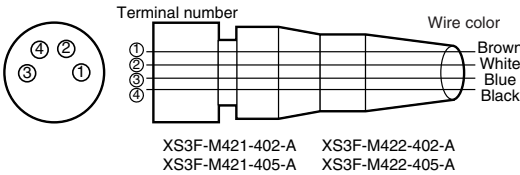
NPN Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3X-NA11 E3X-NA6 E3X-NAG11 E3X-NA11F E3X-NA11V E3X-NA14V	Light-ON	 Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Reset (Between brown and black leads)	LIGHT ON (L-ON)	 Operation indicator (orange) Photo-electric Sensor main circuit Brown Black Blue Load Control output 12 to 24 VDC
	Dark-ON	 Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Reset (Between brown and black leads)	DARK ON (D-ON)	M8 Connector Pin Arrangement  Note: Pin 2 is not used.
E3X-NA21	Light-ON	 Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Reset (Between brown and black leads)	LIGHT ON (L-ON)	 Operation indicator (orange) Photo-electric Sensor main circuit Brown Black Orange Blue Load Control output Load (relay) 12 to 24 VDC 0 V Self-diagnosis output
	Dark-ON	 Incident light No incident light Operation indicator (orange) ON OFF Output transistor ON OFF Load (relay) Operate Reset (Between brown and black leads)	DARK ON (D-ON)	 Incident level indicators (4 green, 1 red)

PNP Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3X-NA41 E3X-NA8 E3X-NAG41 E3X-NA41F E3X-NA41V E3X-NA44V	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	
E3X-NA51	Light-ON		LIGHT ON (L-ON)	
	Dark-ON		DARK ON (D-ON)	

Plug (Sensor I/O Connector)

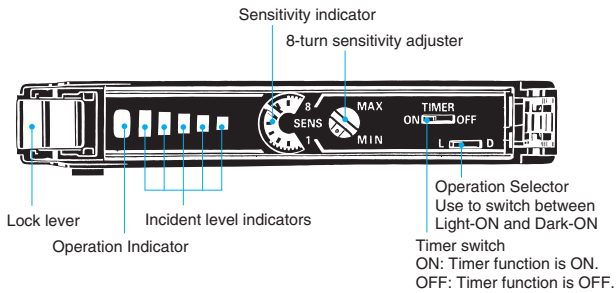


Classification	Wire color	Connection pin	Application
DC	Brown	1	Power supply (+V)
	White	2	---
	Blue	3	Power supply (0 V)
	Black	4	Output

Note: Pin 2 is not used.

Nomenclature

Amplifier Units



Safety Precautions

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 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.

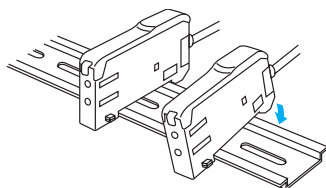
If an excessive amount of light is received via the Sensor, the mutual interference prevention function may not work. In this case, make the appropriate adjustments using the sensitivity adjuster. The mutual interference prevention function will not operate when the E3X-NA is used side-by-side with E3X-DA-N models.

● Mounting

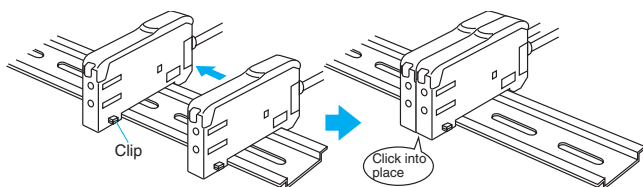
DIN Track Mounting/Removal

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.)

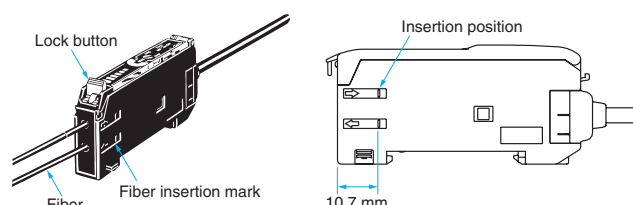
Note: 1. The specifications for ambient temperature will vary according to the number of Amplifier Units used together. For details, refer to *Ratings and Specifications*.
2. Always turn OFF the power supply before mounting or removing Amplifier Units.

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:

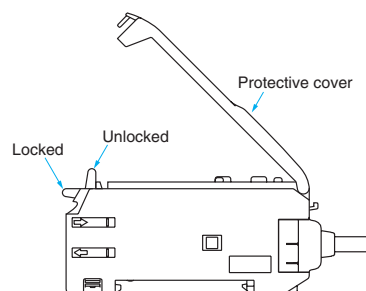
1. Connection

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

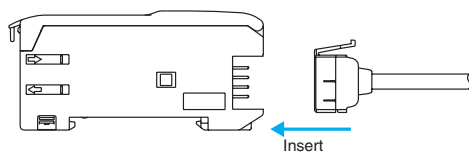
Be sure to mount the Protective Cover before use.

Amplifier Units with Connectors

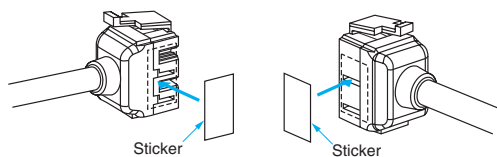
● Mounting

Mounting Connectors

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



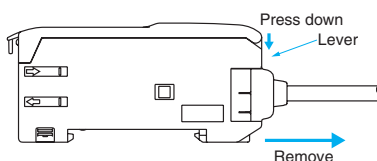
2. Join Amplifier Units together as required after all the Master and Slave Connectors have been inserted.
3. Attach the seals (provided as accessories) to the sides of Master and Slave Connectors that are not connected to other Connectors.



Note: Attach the stickers to the sides with grooves.

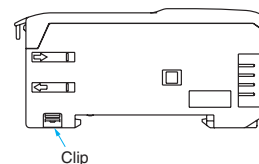
Removing Connectors

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.)



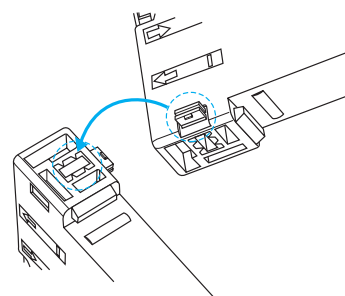
Mounting End Plate (PFP-M)

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.

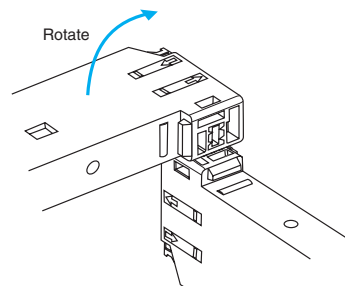


The clip can also be removed using the following mechanism, which is incorporated in the construction of the section underneath the clip.

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.

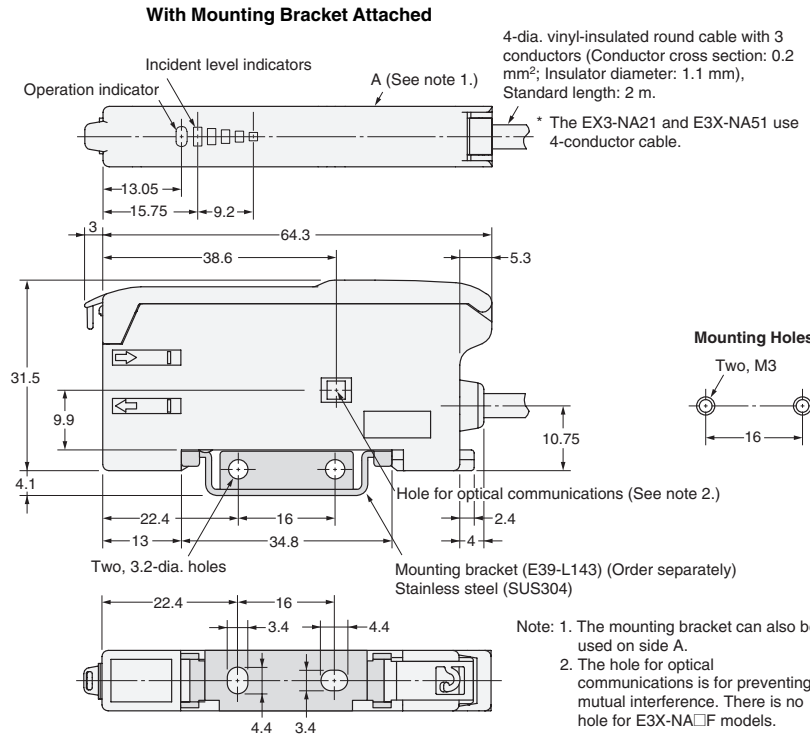
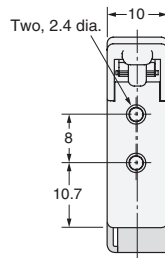
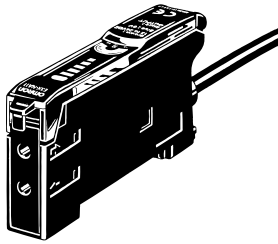
E3X-CN12: 12 N max.

Dimensions

Amplifier Units

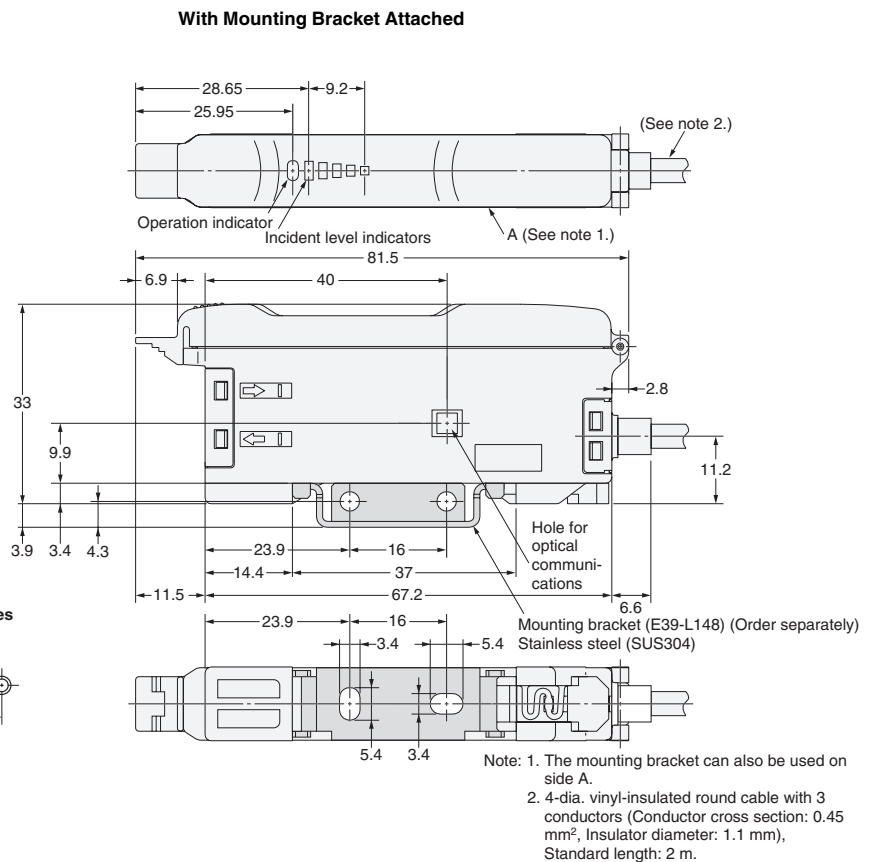
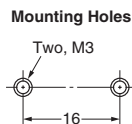
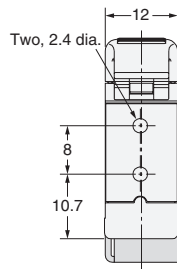
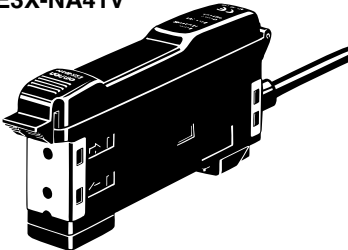
Amplifier Units with Cables

E3X-NA11
E3X-NA11F
E3X-NA41
E3X-NA41F
E3X-NAG11
E3X-NAG41
E3X-NA21
E3X-NA51

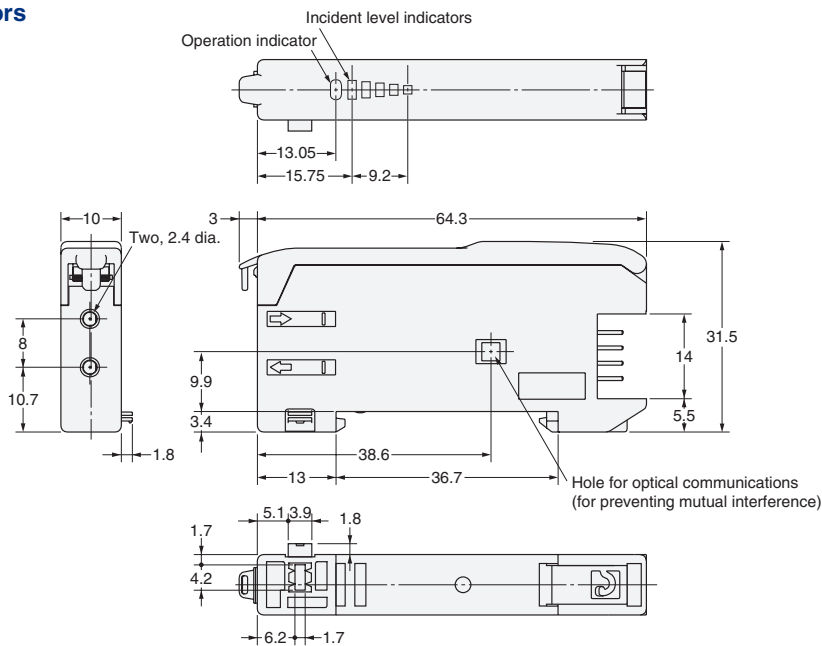
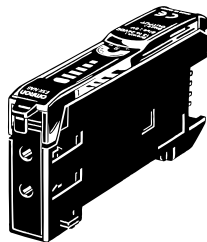


Amplifier Units with Cables, Water-resistant Models

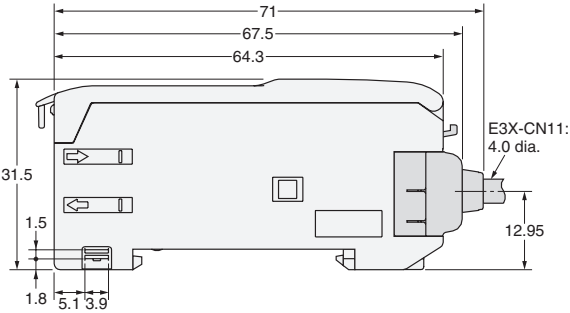
E3X-NA11V
E3X-NA41V



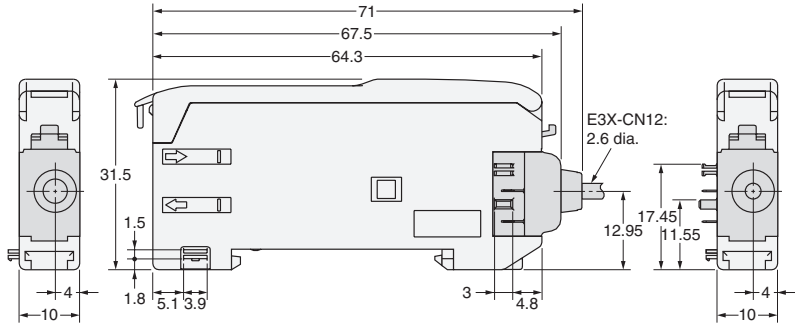
Amplifier Units with Connectors
E3X-NA6
E3X-NA8



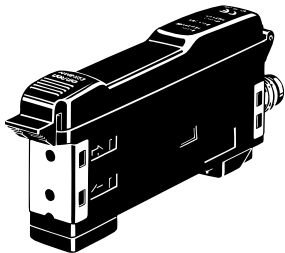
Dimensions with Master Connector Connected



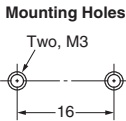
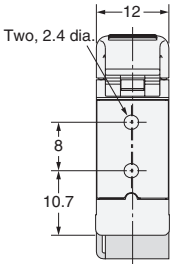
Dimensions with Slave Connector Connected



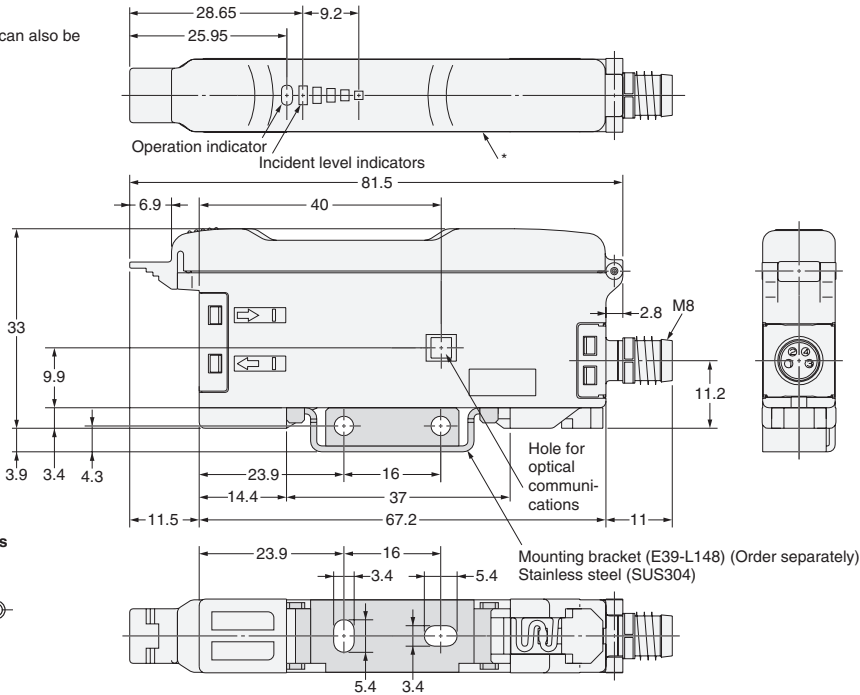
Amplifier Units with Connectors, Water-resistant
Models
E3X-NA14V
E3X-NA44V



* The mounting bracket can also be used on this side.



With Mounting Bracket Attached



- Amplifier Unit Connectors
- Sensor I/O Connectors
- Accessories (Order Separately)
- Mounting Brackets
- End Plates

Refer to E32 Series for details on Fiber Units.