

Digital Fiber Sensors

E3X-DA-S

Tough Fiber Sensor with the World's Most Stable Detection

- With four times the light intensity, the E3X-DA-S provides higher reliability in environments with dust and dirt.
- Two times the sensing distance. The E3X-DA-S enables stable long-distance detection even with flexible or extremely thin fibers.
- Variations in the incident level when inserting the fiber are reduced to half through uniform light distribution.
- Further development of signal processing technology ensures stable detection of minute objects.
- Power consumption has been reduced to half in comparison with previous models in due consideration of environmental issues.



Ordering Information

Amplifier Units

Pre-wired Models

Appearance	Functions	Model	
		NPN output	PNP output
	Tough Mode Timer Twin outputs ATC (Threshold value automatic correction) Differential operation External input	E3X-DA21-S 2M	E3X-DA51-S 2M

Models with Connectors

Appearance	Functions	Model	
		NPN output	PNP output
	Tough Mode Timer Twin outputs ATC (Threshold value automatic correction) Differential operation	E3X-DA7-S	E3X-DA9-S

Amplifier Unit Connectors (Order Separately)

Item	Appearance	Cable length	No. of conductors	Model
Master Connector		2 m	4	E3X-CN21
Slave Connector			2	E3X-CN22

Note: The E3X-CN11/12 can also be used for connection, but only one of the two output channels can be used.

Combining Amplifier Units and Connectors

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

Amplifier Unit		Applicable connector (order separately)	
NPN output	PNP output	Master Connector	Slave Connector
E3X-DA7-S	E3X-DA9-S	E3X-CN21	E3X-CN22

When Using 5 Amplifier Units

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

Mounting Bracket

Appearance	Model	Quantity
	E39-L143	1

End Plate

Appearance	Model	Quantity
	PFP-M	1

E3X-DA-S

Ratings and Specifications

Amplifier Units

Item	Model	E3X-DA□-S (□: 21/51/7/9)
Light source (wavelength)		Red LED (625 nm)
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) 10% max.
Power consumption		Normal: 960 mW max. (Current consumption: 40 mA max. at 24 VDC, 80 mA max. at 12 VDC) Power saving ECO1: 720 mW max. (Current consumption: 30 mA max. at 24 VDC, 60 mA max. at 12 VDC) Power saving ECO2: 600 mW max. (Current consumption: 25 mA max. at 24 VDC, 50 mA max. at 12 VDC)
Control output		Load power supply voltage: 26.4 VDC max.; NPN/PNP open collector; load current: 50 mA max.; residual voltage: 2 V max.; OFF current: 0.5 mA max.
External input*1		No-voltage input (contact/transistor)*2
Protection circuits		Reverse polarity for power supply connection, output short-circuit, output reverse polarity protection
Re-sponse time	Super-high-speed Mode*3	Operate or reset: 80 μs
	High-speed Mode	Operate or reset: 250 μs
	Standard Mode	Operate or reset: 1 ms
	High-resolution Mode	Operate or reset: 4 ms
	Tough Mode	Operate or reset: 16 ms
Sensitivity setting		Teaching or manual method
Func-tions	Power tuning	Light emission power and reception gain, digital control method
	Differential de-tection	Switchable between Single-edge and Double-edge Detection Modes. Single edge: Set to 250 μs, 500 μs, 1 ms, 10 ms, or 100 ms. Double edge: Set to 500 μs, 1 ms, 2 ms, 20 ms, or 200 ms
	Timer function	Select from OFF-delay, ON-delay, one-shot, or ON-delay + OFF-delay timer 1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 5-ms increments, 200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments)
	Automatic pow-er control (APC)	High-speed control method for emission current
	ATC	Supported
	Zero reset	Negative values can be displayed. (Threshold value is shifted.)
	Resetting set-tings	Select from initial reset (factory defaults) or user reset (saved settings).
	Mutual inter-ference preven-tion	Possible for up to 10 Units*4
	ECO Mode*5	Select from lit display, dimmed display, or OFF.
	External input setting*1	Select from teaching operations, power tuning, zero reset, emitter OFF, or ATC start.
Output setting	Select from output for each channel, area output, or self-diagnosis.	
Display		Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange)

*1. Only for Pre-wired models.

*2. Input Specifications

	Contact input (relay or switch)	Non-contact input (transistor)
NPN	ON: Shorted to 0 V (sourcing current: 1 mA max.). OFF: Open or shorted to Vcc.	ON: 1.5 V max. (sourcing current: 1 mA max.) OFF: Vcc - 1.5 V to Vcc (leakage current: 0.1 mA max.)
PNP	ON: Shorted to Vcc (sinking current: 3 mA max.). OFF: Open or shorted to 0 V.	ON: Vcc - 1.5 V to Vcc (sinking current: 3 mA max.) OFF: 1.5 V max. (leakage current: 0.1 mA max.)

*3. The communications function and mutual interference prevention function are disabled if detection is set to Super-high-speed Mode.

*4. Mutual interference prevention can be used for only up to 6 Units if power tuning is enabled.

*5. When the ECO Mode is enabled, the rating sensing distance is approx. 1/2 and the incident level is approx. 1/3 of the normal levels.

Item	Model	E3X-DA□-S (□: 21/51/7/9)
Digital display		Select from incident level + threshold or other 6 patterns
Display orientation		Switching between normal/reversed display is possible.
Ambient illumination (Receiver side)		Incandescent lamp: 10,000 lux max. Sunlight: 20,000 lux max.
Ambient temperature range		Operating: Groups of 1 to 2 Amplifiers: -25 to 55°C Groups of 3 to 10 Amplifiers: -25 to 50°C Groups of 11 to 16 Amplifiers: -25 to 45°C Storage: -30 to 70°C (with no icing or condensation)
Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)
Insulation resistance		20 MΩ min. (at 500 VDC)
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute
Vibration resistance		Destruction: 10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y and Z directions
Degree of protection		IEC 60529 IP50 (with Protective Cover attached)
Connection method		Pre-wired or Amplifier Unit Connector
Weight (packed state)		Pre-wired models: Approx. 100 g, Models with Connectors: Approx. 55 g
Materials	Case	Polybutylene terephthalate (PBT)
	Cover	Polycarbonate (PC)
Accessories		Instruction Manual

Amplifier Unit Connectors

Item	Model	E3X-CN21/22
Rated current		2.5 A
Rated voltage		50 V
Contact resistance		20 mΩ max. (20 mVDC max., 100 mA max.) (The figure is for connection to the Amplifier Unit and the adjacent Connector. It does not include the conductor resistance of the cable.)
No. of insertions		Destruction: 50 times (The figure for the number of insertions is for connection to the Amplifier Unit and the adjacent Connector.)
Materials	Housing	Polybutylene terephthalate (PBT)
	Contacts	Phosphor bronze/gold-plated nickel
Weight (packed state)		Approx. 55 g

Sensing Distance

Through-beam Models

(Unit: mm)

Type		Model	E3X-DA□-S (□: 21/51/7/9)					
			Tough Mode	High-resolution Mode	Standard Mode	High-speed Mode	Super-high-speed Mode	
Standard models	Flexible (new standard)	E32-T11N/E32-T11R/ E32-T12R/E32-T15XR/ E32-TC200BR(B4R)	2,000	1,400	1,000	700	280	
		E32-T14LR/E32-T15YR/ E32-T15ZR	750	550	450	260	100	
		E32-T21R/E32-T22R/ E32-T222R/E32-T25XR/E32- TC200FR(F4R)	450	300	250	150	60	
		E32-T24R/E32-T25YR/ E32-T25ZR	170	120	100	50	20	
	Standard	E32-TC200/E32-T12/ E32-T15X/E32-TC200B(B4)	2,800	2,000	1,550	1,000	400	
		E32-T14L/E32-T15Y/ E32-T15Z	1,700	1,200	950	600	240	
		E32-TC200A	2,500	1,800	1,350	900	360	
		E32-TC200E/E32-T22/ E32-T222/E32-T25X/ E32-TC200F(F4)	750	550	450	250	100	
		E32-T24/E32-T25Y/ E32-T25Z	450	300	250	150	60	
	Break-resistant	E32-T11/E32-T12B/ E32-T15XB	2,500	1,800	1,350	900	360	
		E32-T21/E32-T221B/ E32-T22B	680	480	400	220	90	
		E32-T25XB	500	360	300	170	70	
	Fluorine coating	E32-T11U	2,500	1,800	1,350	900	360	
	Special-beam models	Long-distance, high power	E32-T17L	20,000*1	20,000*1	20,000*1	20,000*1	8,000
			E32-T11N + E39-F1	4,000*2	4,000*2	4,000*2	4,000*2	2,000
E32-TC200 + E39-F1			4,000*2	4,000*2	4,000*2	4,000*2	3,000	
E32-T11R + E39-F1			4,000*2	4,000*2	4,000*2	4,000*2	2,000	
E32-T11 + E39-F1			4,000*2	4,000*2	4,000*2	4,000*2	1,860	
E32-T14			4,000*2	4,000*2	4,000*2	4,000*2	1,800	
E32-T11L/E32-T12L			4,000*2	3,400	2,700	1,740	700	
E32-T11L + E39-F2			2,550	1,820	1,600	1,000	360	
E32-T11R + E39-F2			1,450	1,040	800	500	200	
E32-T11 + E39-F2			2,300	1,640	1,320	860	320	
Ultracompact, ultrafine sleeve		E32-T21L/E32-T22L	1,500	1,080	880	500	200	
		E32-T223R	450	300	250	150	60	
		E32-T33-S5	150	110	90	50	20	
		E32-T333-S5	35	25	20	12	8	
Fine beam		E32-T334-S5	18	12	10	6	4	
		E32-T22S	4,000*2	4,000*2	3,800	2,500	1,000	
Area sensing		E32-T24S	4,000*2	3,500	2,600	1,740	700	
		E32-T16PR	3,100	2,200	1,700	1,120	440	
		E32-T16P	4,000*2	3,000	2,200	1,500	600	
		E32-T16JR	2,750	2,000	1,500	960	380	
		E32-T16J	3,650	2,600	2,000	1,300	520	
		E32-T16WR	4,000*2	3,400	2,600	1,700	680	
		E32-T16W	4,000*2	4,000*2	3,600	2,300	900	
		E32-T16	4,000*2	4,000*2	4,000*2	3,700	1,480	
E32-M21		2,100	1,500	1,300	700	280		

*1. The optical fiber is 10 m long on each side, so the sensing distance is 20,000 mm

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

Type		Model	E3X-DA□-S (□: 21/51/7/9)				
			Tough Mode	High-resolution Mode	Standard Mode	High-speed Mode	Super-high-speed Mode
Environment resistant models	Heat-resistant	E32-T51	2,800	2,000	1,500	1,000	400
		E32-T54	840	600	450	300	120
		E32-T81R-S	1,000	720	550	360	140
		E32-T61-S + E39-F2	1,680	1,200	900	600	240
		E32-T61-S + E39-F1	4,000*	4,000*	4,000*	4,000*	1,800
		E32-T84S-S	4,000*	3,500	2,600	1,740	700
		E32-T61-S	1,680	1,200	900	600	240
	Chemical resistant	E32-T11F	4,000*	4,000*	4,000*	2,600	1,000
		E32-T12F	4,000*	4,000*	4,000*	4,000*	1,600
		E32-T14F	1,400	1,000	800	500	200
		E32-T51F	4,000*	3,600	2,800	1,800	700
		E32-T81F-S	2,580	1,800	1,400	920	380
	Vacuum resistant	E32-T51V	720	520	400	260	100
		E32-T51V + E39-F1V	3,780	2,700	2,000	1,360	520
		E32-T54V	580	420	250	200	70
		E32-T54V + E39-F1V	1,850	1,320	1,000	660	360
		E32-T84SV	1,760	1,250	950	640	260

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

Reflective Models

(Unit: mm)

Type		Model	E3X-DA□-S (□: 21/51/7/9)				
			Tough Mode	High-resolution Mode	Standard Mode	High-speed Mode	Super-high-speed Mode
Standard models	Flexible (new standard)	E32-D11N/E32-D11R/ E32-D12R/E32-D15XR/ E32-DC200BR(B4R)	840	600	350	240	100
		E32-D14LR	220	160	100	60	28
		E32-D15YR/E32-D15ZR	200	140	100	52	24
		E32-D211R/E32-D21R/ E32-D22R/E32-D25XR/ E32-DC200FR(F4R)	140	100	60	40	16
		E32-D24R	70	52	30	20	8
		E32-D25YR/E32-D25ZR	40	28	16	10	4
	Standard	E32-DC200/E32-D15X/ E32-DC200B(B4)	1,400	1,000	600	400	180
		E32-D12	1,120	800	450	320	140
		E32-D14L	560	400	220	160	72
		E32-D15Y/E32-D15Z	480	340	200	130	60
		E32-D211/E32-DC200E/E32- D22/E32-D25X/ E32-DC200F(F4)	360	260	160	100	44
		E32-D24	140	100	60	40	16
		E32-D25Y/E32-D25Z	100	70	40	24	12
	Break-resistant	E32-D11/E32-D15XB	840	600	350	240	100
		E32-D21B/E32-D221B	300	220	280	90	40
		E32-D21/E32-D22B	140	100	60	40	16
		E32-D25XB	240	170	100	60	30
	Fluorine coating	E32-D11U	840	600	350	240	100

E3X-DA-S

Model			E3X-DA□-S (□: 21/51/7/9)					
			Tough Mode	High-resolution Mode	Standard Mode	High-speed Mode	Super-high-speed Mode	
Type								
Special-beam models	Long distance, high power	E32-D16	40 to 2,800	40 to 2,000	40 to 1,400	40 to 900	40 to 480	
		E32-D11L	1,820	1,300	800	520	220	
		E32-D21L/E32-D22L	580	420	260	160	70	
	Ultracompact, ultrafine sleeve	E32-D33	70	50	30	20	8	
		E32-D331	14	10	6	4	2	
	Coaxial/small spot	E32-C11N	780	560	350	320	100	
		E32-C31N	110	80	50	46	14	
		E32-CC200R	700	500	300	200	90	
		E32-CC200	1,400	1,000	600	400	180	
		E32-D32L	700	500	300	200	90	
		E32-C31/E32-D32	330	240	150	100	44	
		E32-C42 + E39-F3A	The spot diameter is from 0.1 to 0.6 mm at distance of 6 to 15 mm.					
		E32-D32 + E39-F3A	The spot diameter is from 0.5 to 1mm at distance of 6 to 15 mm.					
		E32-C41 + E39-F3A-5	The spot diameter is 0.1 mm at a distance of 7 mm.					
		E32-C31 + E39-F3A-5	The spot diameter is 0.5 mm at a distance of 7 mm.					
		E32-C41 + E39-F3B	The spot diameter is 0.2 mm at a distance of 17 mm.					
	E32-C31 + E39-F3B	The spot diameter is 0.5 mm at a distance of 17 mm.						
	E32-C31 + E39-F3C	Spot diameter of 4 mm max. at distances in the range 0 to 20 mm.						
	Area sensing	E32-D36P1	700	500	300	200	90	
	Retroreflective	E32-R21 + E39-R3 (provided)*1		10 to 250				
		E32-R16 + E39-R1 (provided)*1		150 to 1,500				
	Convergent-reflective*2	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				
	Environment-resistant models	Heat-resistant	E32-D51	1,120	800	450	320	144
E32-D81R-S			420	300	180	120	54	
E32-D61-S								
E32-D73-S		280	200	120	80	36		
Chemical-resistant		E32-D12F*3	---	320	190	130	60	
	E32-D14F*3	---	140	80	60	20		

*1. With a sensing object that has a high degree of reflectivity, the Sensor may detect light reflected from the object.

*2. If operation is affected by the background, perform power tuning or set operation to ECO Mode to reduce the amount of light that is received.

*3. Even if there is no sensing object, the Sensor will detect light that is reflected by the fluororesin.

Application-specific Models

(Unit: mm)

Type		Model	E3X-DA□-S (□: 21/51/7/9)				
			Tough Mode	High-resolution Mode	Standard Mode	High-speed Mode	Super-high-speed Mode
Application-specific Models	Label detection	E32-G14	10				
		E32-T14	4,000*1	4,000*1	4,000*1	4,000*1	1,800
	Liquid-level detection	E32-L25T	Applicable tube: Transparent tube with a diameter in the range 8 to 10 mm and a recommended wall thickness of 1 mm				
		E32-D36T	Applicable tube: Transparent tube (no restriction on diameter)*2, *3				
		E32-A01	Applicable tube: Transparent tube with a diameter of 3.2, 6.4, or 9.5 mm and a recommended wall thickness of 1 mm				
		E32-A02	Applicable tube: Transparent tube with a diameter in the range 6 to 13 mm and a recommended wall thickness of 1 mm*2				
		E32-D82F1(F2)	Liquid-contact model*2				
	Glass-substrate alignment*4	E32-L16-N	0 to 15			0 to 12	
		E32-A08	10 to 20			---	
		E32-A07E1(E2)	15 to 25			---	
		E32-L66	5 to 18		5 to 16	---	
	Glass-substrate mapping	E32-A09/E32-A09H	15 to 38			---	
		E32-A09H2	20 to 30			---	
	Wafer mapping	E32-A03/E32-A03-1	3,220	2,300	1,780	1,200	500
		E32-T24S	4,000*1	3,500	2,600	1,740	700
		E32-A04/E32-A04-1	1,280	920	680	450	200

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

*2. If a high level of light is received, perform power tuning or set operation to ECO Mode to reduce the amount of light that is received.

*3. In Tough Mode, detection may not be possible depending on the pipe diameter. Check operation with the pipe to be used.

*4. If operation is affected by the background, perform power tuning or set operation to ECO Mode to reduce the amount of light that is received.

E3X-DA-S

I/O Circuit Diagrams

NPN Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3X-DA21-S	Light-ON	ch1/ Incident light	LIGHT ON (L-ON)	
	Dark-ON	ch1/ Incident light	DARK ON (D-ON)	
E3X-DA7-S	Light-ON	ch1/ Incident light	LIGHT ON (L-ON)	
	Dark-ON	ch1/ Incident light	DARK ON (D-ON)	

PNP Output

Model	Operation mode	Timing charts	Operation selector	Output circuit
E3X-DA51-S	Light-ON	ch1/ Incident light	LIGHT ON (L-ON)	
	Dark-ON	ch1/ Incident light	DARK ON (D-ON)	
E3X-DA9-S	Light-ON	ch1/ Incident light	LIGHT ON (L-ON)	
	Dark-ON	ch1/ Incident light	DARK ON (D-ON)	

Note: 1. Operation with area settings is as follows:

LIGHT ON: ON when the incident level is between the thresholds for channels 1 and 2.

DARK ON: OFF when the incident level is between the thresholds for channels 1 and 2.

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

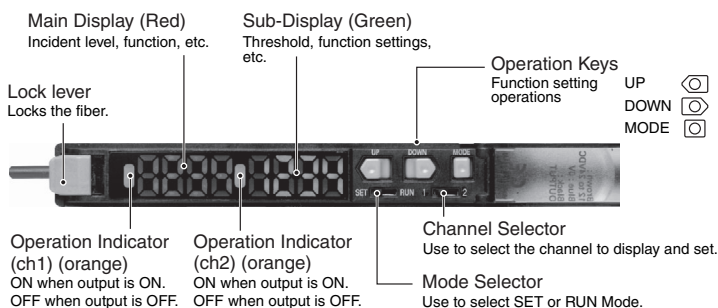
ON delay	OFF delay	One-shot	ON delay and OFF delay

T₁: ON-delay set time
 T₂: OFF-delay set time
 T₁ and T₂ can be set separately.

Nomenclature

Amplifier Units

E3X-DA□-S (□: 21/51/7/9)



Adjustment Method

1 Setting the Operation Mode

The operation mode is set in SET Mode.
→ Refer to 5. Setting Functions on page 11.

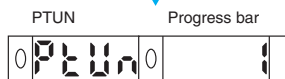
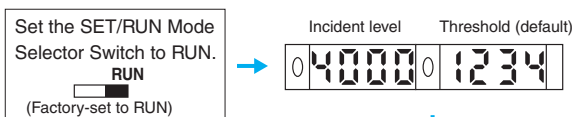
Set the Channel Selector Switch to the desired channel before making any adjustments or settings.

2 Adjusting the Power (RUN Mode)

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

* Confirm that the MODE Key setting is PTUN (power tuning). The default setting is PTUN.
→ Refer to 5. Setting Functions on page 11.

* If power tuning is executed while SHS is selected for the detection function, the minimum power will be set.



Release the key after the progress bar is displayed.



This completes the adjustment.



To restore the default power setting:

DOWN + MODE (Press both for 3 s.)

"OFF" will flash twice.

PTUN OFF
0 PtUn 0 0FF

Incident level Threshold
0 4000 0 1234

This restores the default setting.

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

Display	Error	Action
Flashes twice 0 PtUn 0 0vEr PTUN OVER	Over Error The incident light level is too low for the power tuning target value.	The power will not be tuned. The power can be increased up to approximately 5 times the incident light value.
Flashes twice 0 PtUn 0 0bOtM PTUN BOTM	Bottom Error The incident light level is too high for the power tuning target value.	The power will be turned to the minimum level. The power can be decreased down to approximately 1/20th the incident light value.

* Press the DOWN Key right after pressing the MODE Key.

3 Setting Thresholds Manually (RUN Mode)

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

Set the Mode Selector Switch to RUN.
RUN
(Factory-set to RUN)

Light level Threshold (default)
0 2000 0 1234

UP DOWN
Increases threshold. Decreases threshold.

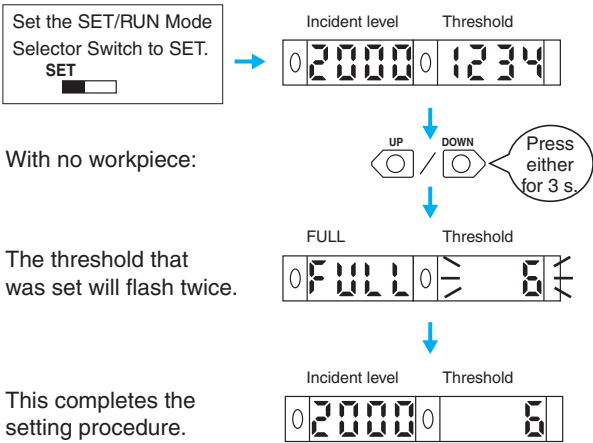
* Even if the display method is changed, the threshold will appear on the sub-display when the key is pressed.

4 Teaching the Threshold (SET Mode)

- * There are five methods that can be used for teaching, as described below. Use the method most suitable for the application.
- * Two-point teaching, positioning teaching, and automatic teaching can be performed in RUN Mode. For operating procedures, refer to the *Instruction Manual* provided with the product.
- * An error has occurred if OVER or LO is displayed on the sub-display. If that occurs, repeat the operation from the beginning.

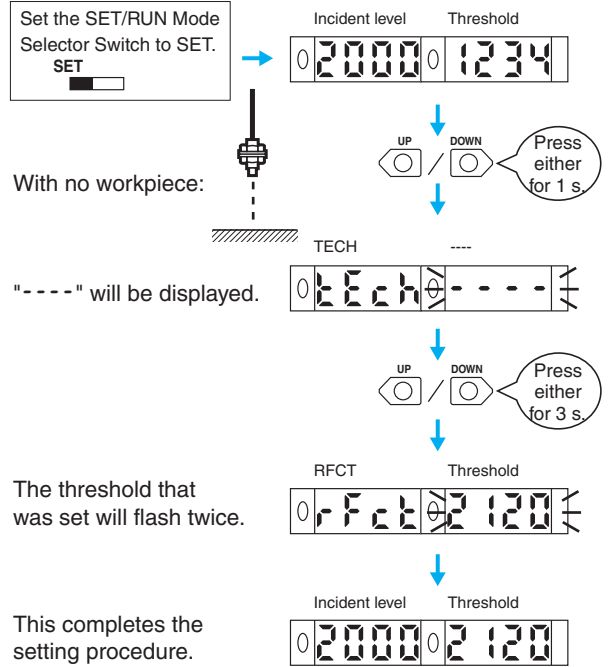
4-1. Setting the Threshold at Maximum Sensitivity

The threshold can be set to the maximum sensitivity. This is useful when the longest detection distance is required.



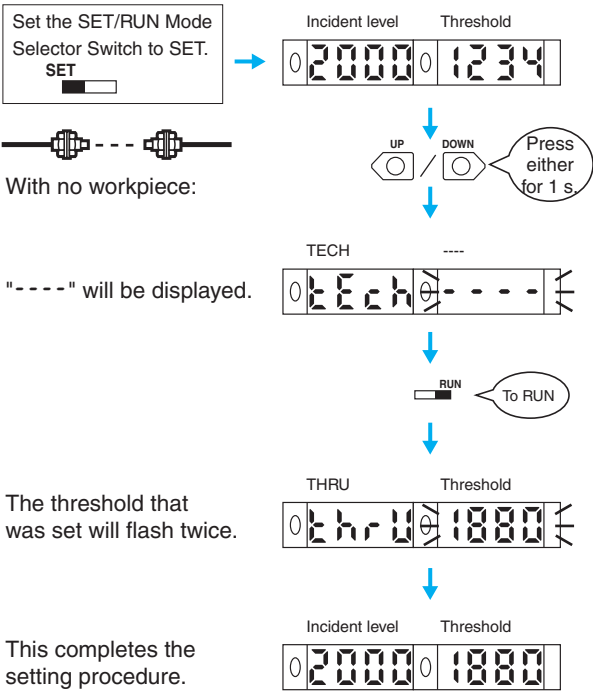
4-3. Teaching a Reflective Fiber Unit without a Workpiece

You can set the threshold to above the incident light level without a workpiece by the percentage set for the teaching level. → Refer to 5. Setting Functions on page 11.



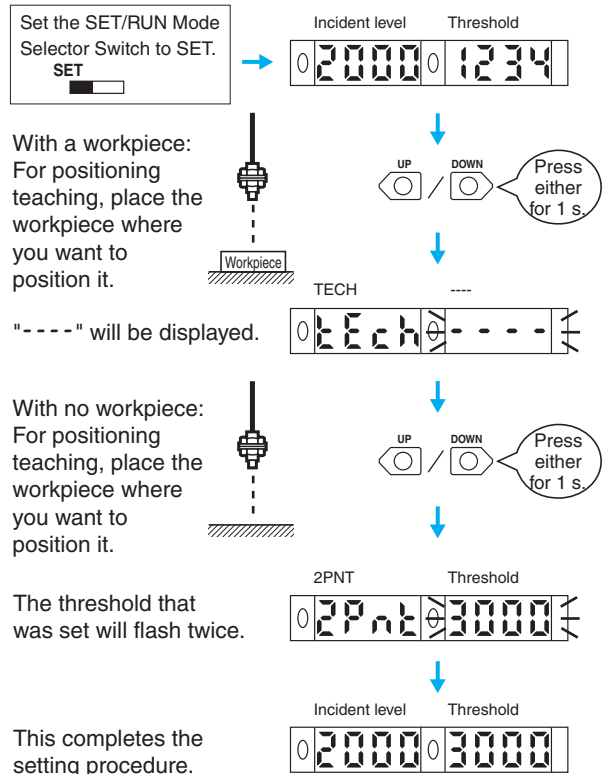
4-2. Teaching a Through-beam Fiber Unit without a Workpiece

You can set the threshold to below the incident light level without a workpiece by the percentage set for the teaching level. → Refer to 5. Setting Functions on page 11.



4-4. Two-point Teaching
4-5. Positioning Teaching

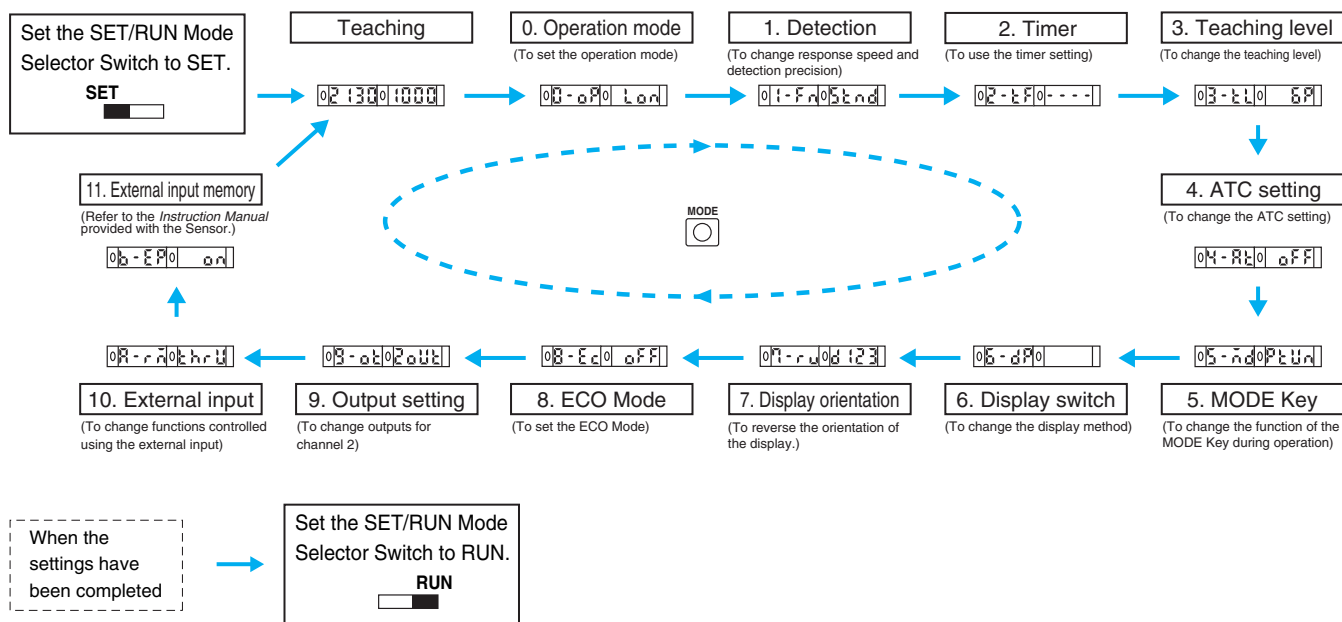
Two points in the following figures are detected, and the intermediate point of the light levels for the two points is set as the threshold.



5 Setting Functions (SET Mode)

Moving between Functions → Refer to 4. Teaching the Threshold on page 10.

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







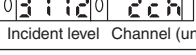


Functions

Use the UP and DOWN Keys to change the settings.

Function *	Setting (display)	Description
0. Operation mode	Light ON: $\downarrow \text{ON}$, Dark ON: dON	→ Refer to 1. Setting the Operation Mode on page 9.
1. Detection *	Super-high-speed: SHS , High-speed: HS , Standard: Skn , High-resolution: HRES , Tough: tG , Differential operation: dIF	Used to change the response speed or detection precision.
	Differential edge (differential operation selected) Single edge: $_ \uparrow _$, Double edge: $_ \uparrow _$	Used to set the edge to be detected.
	Differential time Single edge--250 μs : 1, 500 μs : 2, 1 ms: 3, 10 ms: 4, 100 ms: 5, Double edge--500 μs : 1, 1 ms: 2, 2 ms: 3, 20 ms: 4, 200 ms: 5	Used to set the differential response time.
2. Timer	Timer disabled: --- , OFF-delay timer: OFFd , ON-delay timer: ONd , One-shot timer: 1Sh , ON-delay + OFF-delay timer: ONdF	Used to enable or disable timers.
	Time (timer enabled) 1 to 20 ms: 1-ms increments, 20 to 200 ms: 5-ms increments, 200 ms to 1 s: 100-ms increments, 1 to 5 s: 1-s increments	Used to change timer settings when timers are enabled. The timer can be set from 1 to 5,000 ms.
3. Teaching level	Setting range: 0P to 99P	Used to change the threshold setting when teaching a Through-beam Fiber Unit without a workpiece or teaching a Reflective Fiber Unit without a workpiece.
4. ATC setting	ATC enabled: ON , ATC disabled: OFF	Used to enable or disable the ATC function.
	Setting at Power-ON (ATC ON) No setting: OFF , ATC start processing: Rtc , Power tuning and ATC start processing: PtcRt	Used to set the processing to be performed when the power is turned ON.
5. MODE Key *	Executes power tuning: Ptc , Executes a zero reset: 0rSt , Two-point teaching: 2Pnt , Automatic teaching: Autta , ATC start: Rtc	Used to change the function of the MODE Key during RUN operation.
	Power tuning target value (performing power tuning) Setting range: 100 to 3,900 (increments of 100) Maximum power : FUL	Used to set target values during power tuning. → Refer to 2. Adjusting the Power on page 9.

* The detection settings and MODE Key settings are the same for channel 1 and channel 2. Other functions can be set separately for each channel.

Function *	Setting (display)	Description
6. Display switch	 Incident level Threshold	Used to display the incident light level and the threshold.
	 % incident level Threshold	Used to display the incident light level as a percentage of the threshold and the threshold.
	 PEAK BOTM Fixed interval	Used to display the peak and bottom levels of incident light within a set time. (Updated every 2 s.)
	 L-PE D-BT	Use to display the incident light peak level and no incident light bottom level. (Refreshed when output turns ON or OFF.)
	 Detection status	Analog bar display. The current detection status is displayed as an analog bar. The bar will lengthen from the right as ON status is reached. (ON: Red, OFF: Green)
	 Current incident level PEAK Fixed interval Current incident level Peak incident level	Used to display the current incident light level and the peak incident light level. Display changes at a fixed interval.
	 Incident level Channel (unit number)	Used to display the incident light level and the channel (unit number).
7. Display orientation	Normal display: 123, Up/down reversed display: 321 P	Used to reverse the orientation of the display.
8. ECO Mode	Lit display: 0FF, Dimmed display: E c 0 1, OFF: E c 0 2	Used to enable or disable the ECO Mode.
9. Output setting	Each channel: 2 0 0 0, Output when the incident light level is between two thresholds: R r E R, Self-diagnosis output: S E L F	Used to change the output details for channel 2. This setting will be disabled if the detection function is set to DIFF (i.e., differential operation) and the output will be used for an alarm output.
10. External input	Through-beam, no-workpiece teaching: t h r u, Reflective, no-workpiece teaching: r f c t, Two-point teaching: 2 P n t, Automatic teaching: R u t o, Power tuning: P t u n, Zero reset: 0 r S t, Light OFF: L o f f, ATC start: R t c	Used to change the functions to be controlled using the external input. (Refer to the <i>Instruction Manual</i> provided with the Sensor.)
11. External input memory	Write results to EEPROM: 0 n, Do not write results to EEPROM: 0 F F	Used to set writing the results. (Refer to <i>Instruction Manual</i> provided with the product.)

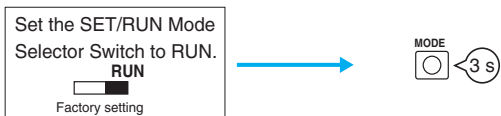
* The same setting is used for channel 1 and channel 2.

6 Convenient Functions

6-1. Setting the Digital Display to Zero (Zero Reset)

The incident light level on the main display can be set to 0. The incident light level and the threshold will both be shifted. This is useful when you want to set the reference display to zero.

* Change the function to 0RST (zero reset) with the MODE Key. The default setting is PTUN.
 → Refer to 5. Setting Functions on page 11.

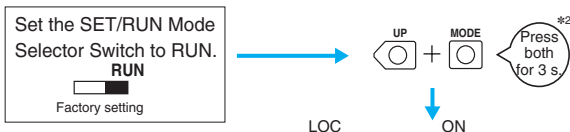


To return to original value for incident light level:



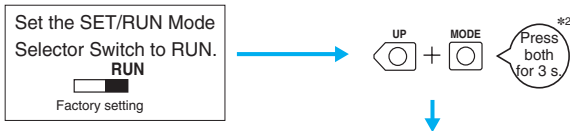
6-2. Locking the Keys (Key Lock)

All key operations can be disabled.



“LOC ON” will flash twice and key operations will be disabled.

To release the lock:



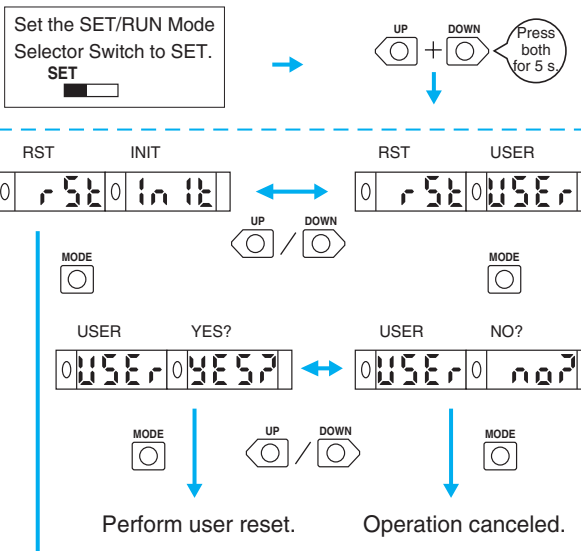
“LOC OFF” will flash twice and key operations will be disabled.

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

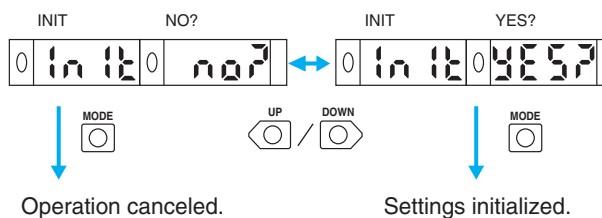
*1. Press the DOWN Key right after pressing the MODE Key.
 *2. Press the UP Key right after pressing the MODE Key.

6-3. Resetting Settings (Initial Reset or User Reset)

All settings can be returned to the factory defaults or to user-saved settings.

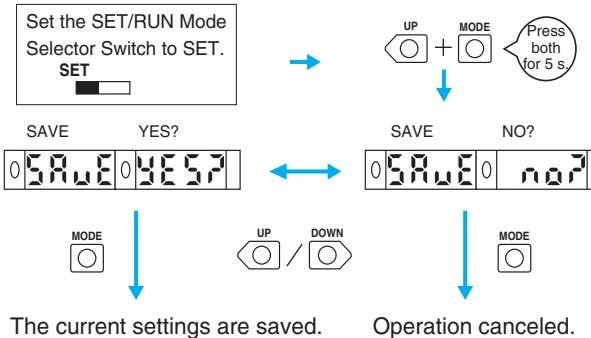


(The steps within the dotted lines can be used if settings have been saved by the user.)



Saving User Settings

The current settings can be saved.



Safety Precautions

To ensure safe operation, be sure to read and follow the *Instruction Manual* provided with the Sensor.

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 use the Sensor with voltage in excess of the rated voltage. Excess voltage may result in malfunction or fire.



Never use the Sensor with an AC power supply. Otherwise, explosion may result.



Precautions for Safe Use

The following precautions must be observed to ensure safe operation of the Sensor.

1. Do not use the Sensor in an environment where explosive or flammable gas is present.
2. Do not use the Sensor in a location subject to splattering with water, streams, oils, or chemicals.
3. Do not attempt to disassemble, repair, or modify the Sensor.
4. Do not apply voltages or currents that exceed the rated range to the Sensor.
5. Do not use the Sensor in an ambient atmosphere or environment that exceeds the ratings.
6. Wire the power supply correctly, including the polarity.
7. Connect the load correctly.
8. Do not short-circuit the load at both ends.
9. Do not use the Sensor if the case is damaged.
10. Dispose of the Sensor as industrial waste.
11. Do not use the Sensor in locations subject to direct sunlight.

Precautions for Correct Use

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

Amplifier Unit

Designing

Operation after Turning Power ON

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

Time may be required for the incident level to stabilize after the power supply is turned ON.

Operation at Power OFF

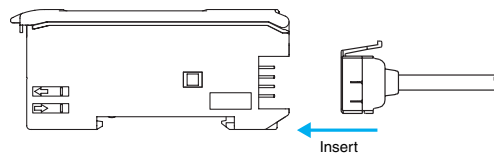
A pulse may be output when the power supply is turned OFF. Turn OFF the power supply to the load or the load line before turning OFF the power supply to the Sensor.

Mounting

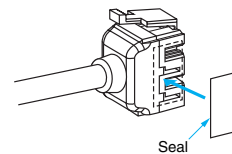
Connecting and Disconnecting Connectors

Mounting Connectors

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



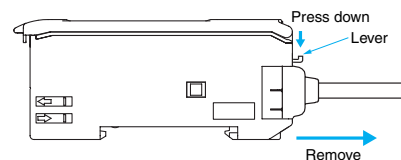
2. Attach the protective seals (provided as accessories) to the sides of master and slave connectors that are not connected.



Note: Attach the seals to the sides with grooves.

Removing Connectors

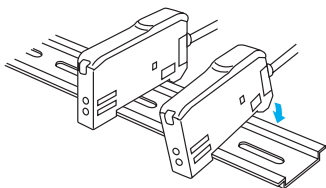
1. Slide the slave Amplifier Unit away from the other Unit.
2. After the Amplifier Unit has been separated, press down on the lever on the Connector and remove it. (Do not attempt to remove a Connector without first separating the Amplifier Unit from the other Units.)



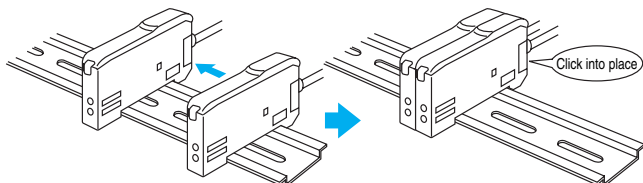
Adding and Removing Amplifier Units

Adding Amplifier Units

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



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



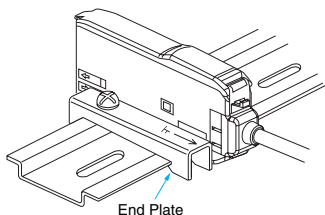
Removing Amplifier Units

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

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

Mounting the End Plate (PFP-M)

Use an End Plate if the Amplifier Unit might move due to vibration.

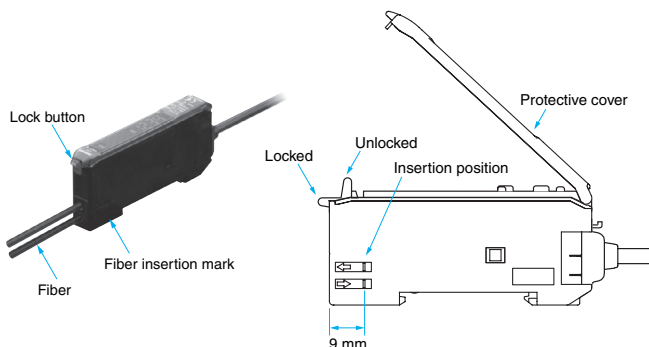


Fiber Connection

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

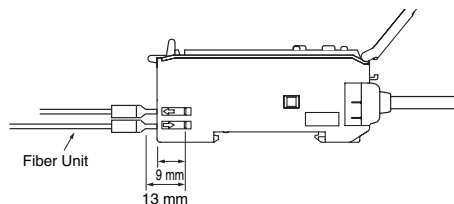
1. Connecting Fibers

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.

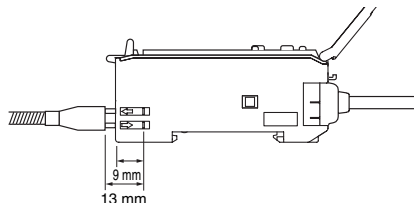


Note: Do not pull on the fiber, apply pressure on it, or otherwise subject it to excessive force when it is attached to the Amplifier Unit. (Use a force of 0.3 N·m max.)

Fibers with E39-F9 Attachment

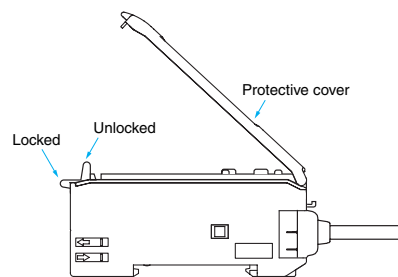


Fibers That Cannot Be Free-Cut (with Sleeves)



2. Disconnecting Fibers

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



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

Adjusting

Mutual Interference Protection Function

The values that appear on the digital display may fluctuate somewhat due to light from other Sensors. If this occurs, you can stabilize detection by lowering the threshold to provide a greater margin in the allowable values.

Output Short-circuits

OVER/CUR will flash on the display if the output short-circuit function operates due to a load short-circuit in a control output. If this occurs, check the load connections.

EEPROM Writing Error

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

Optical Communications

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

Others

Protective Cover

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

Mobile Console

The E3X-MC11-SV2 Mobile Console does not currently support the new Tough Mode and ON-delay + OFF-delay timer. You also cannot use the E3X-MC-S.

Communications Unit

Use an E3X-DRT21-S Version 3 Communications Unit.

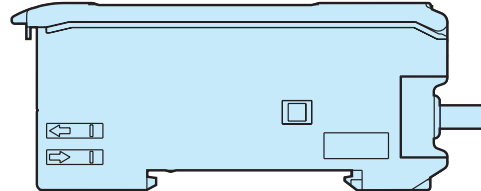
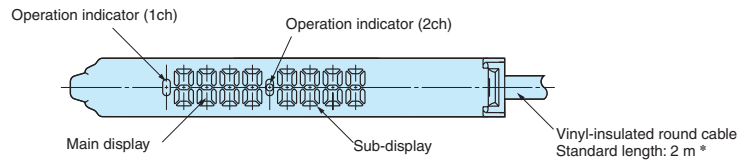
E3X-DA-S

Dimensions

(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

Amplifier Units

Pre-wired Models
E3X-DA21-S
E3X-DA51-S

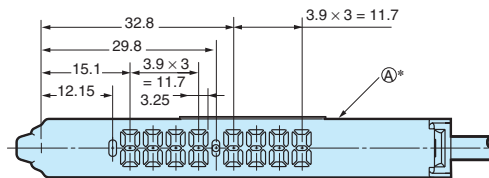


* Cable Specifications

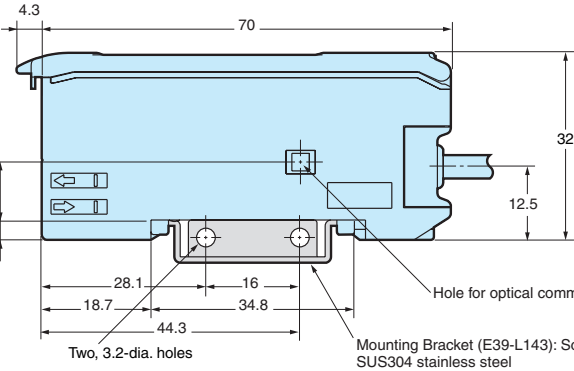
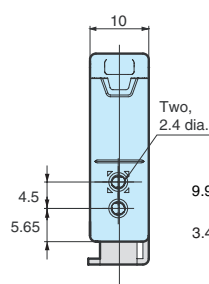
E3X-DA21-S
E3X-DA51-S

4-dia., 5-conductor (Conductor cross section: 0.2 mm², insulator diameter: 1.1 mm)

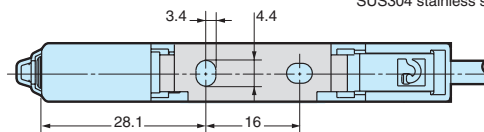
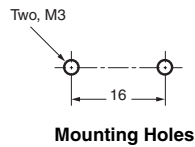
With Mounting Bracket Attached



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



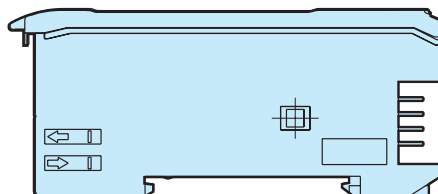
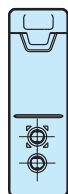
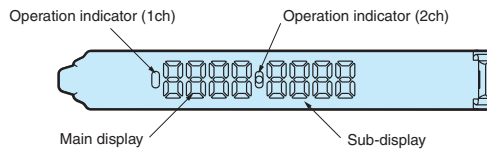
Mounting Bracket (E39-L143): Sold separately. SUS304 stainless steel



Models with Connectors

E3X-DA7-S

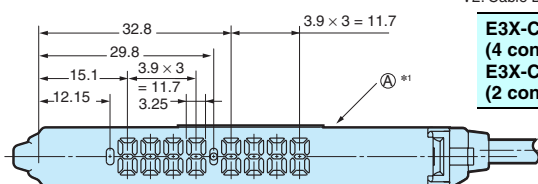
E3X-DA9-S



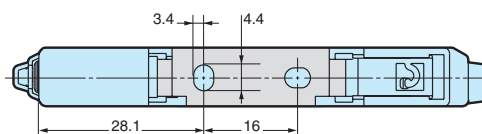
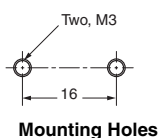
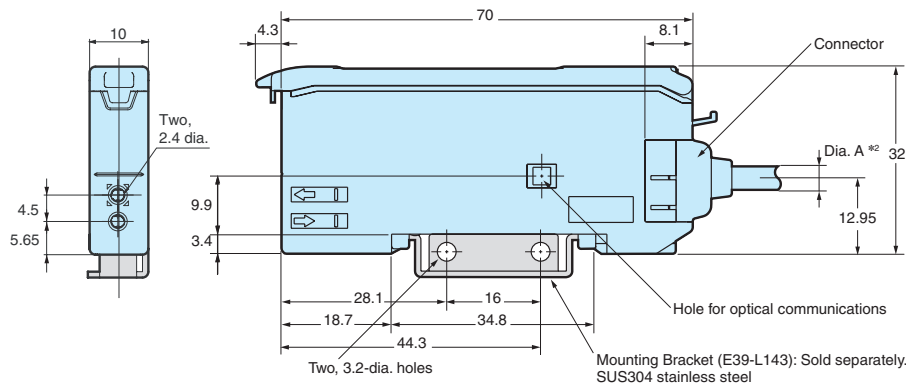
With Mounting Bracket Attached

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

*2. Cable Diameters

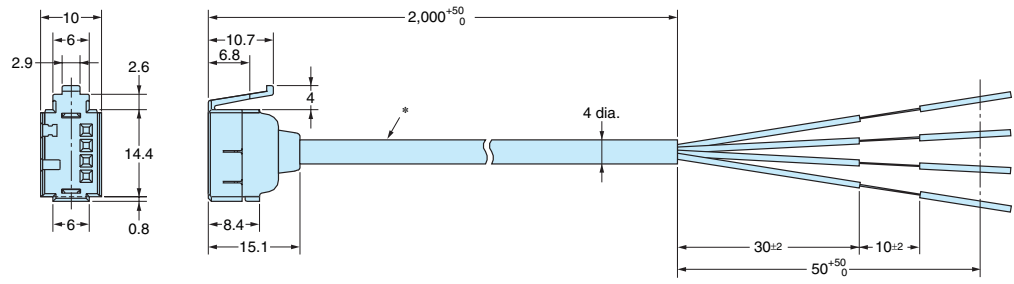
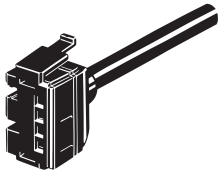


E3X-CN21 (4 conductors)	4.0 dia.
E3X-CN22 (2 conductors)	



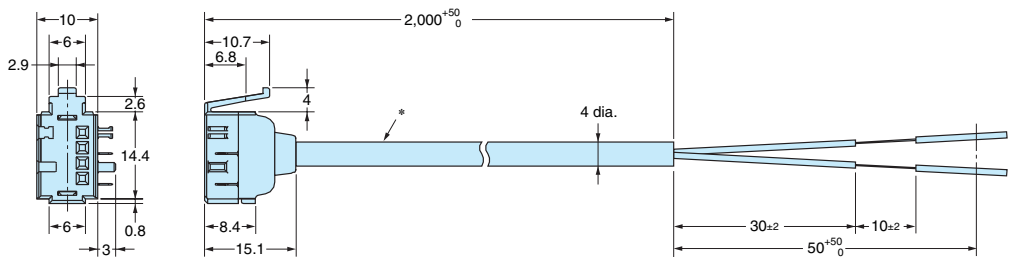
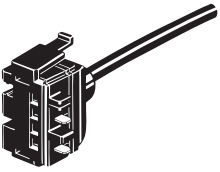
Amplifier Unit Connectors

Master Connectors E3X-CN21



* E3X-CN21: 4-dia. vinyl-insulated round cable with 4 conductors (Conductor cross section: 0.2 mm², Insulator diameter: 1.1 mm)

Slave Connectors E3X-CN22



* E3X-CN22: 4-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.2 mm², Insulator diameter: 1.1 mm)

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 - Delivery and shipping dates are estimates only; and
 - Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
- Claims.** Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
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