E3X-DA-N

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

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

UL991*

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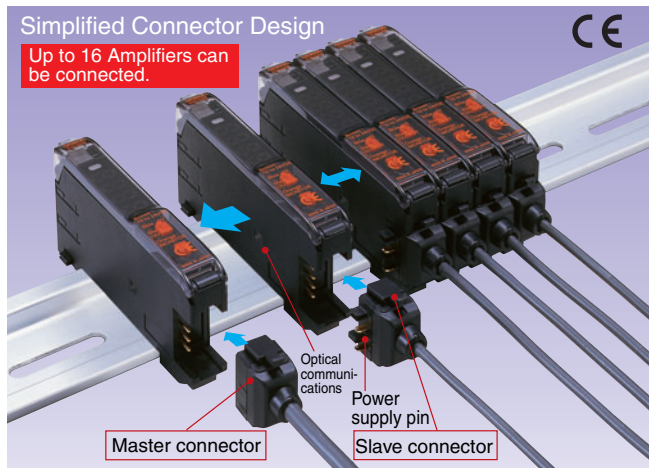• Additional application testing and evaluations standards: UL 991 and SEMI S2-0200S

Features

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

| First in the Industry | Patent Pending |

In Amplifiers with wire-saving connectors, the power supply is distributed to 1-conductor slave connectors through a 3-conductor master connector. This design has three major advantages.
1. Wiring time is significantly reduced.
2. Relay connectors are unnecessary, so wiring takes up less space and costs are reduced.
3. Storage and maintenance are simpler because it isn't necessary to distinguish between master connector and slave connectors on the Amplifier.

Simplified Connector Design

Up to 16 Amplifiers can be connected.

CE

Optical communications
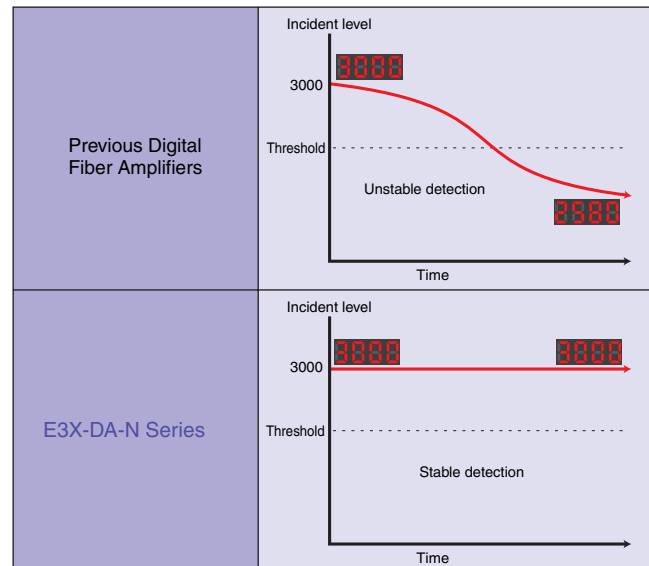Power supply pin

Master connector
Slave connector

Super Digital Display with Auto Power Control (APC) Circuit
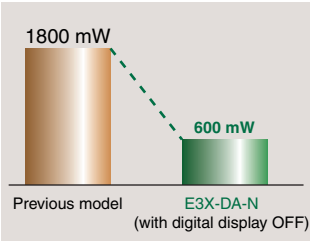
First in the Industry

The passage of time causes the intensity of the Sensor's light-emitting LED elements to deteriorate, which may make stable detection impossible.
The E3X-DA-N is the first series of Fiber Sensors to use an Auto Power Control (APC) circuit. This achieves strict detection by eliminating fluctuation in the digital value and is ideal for subtle detection such as stable detection of liquid-crystal glass.

Previous Digital Fiber Amplifiers

Incident level
3000
Threshold
Unstable detection
Time

E3X-DA-N Series

Incident level
3000
Threshold
Stable detection
Time

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Power Consumption Reduced by As Much As 70%

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

1800 mW

600 mW

Previous model

E3X-DA-N (with digital display OFF)

eco

This eco-label is displayed on products that meet environmental standards established by OMRON.

Digital Display Can Be Turned OFF or Dimmed during Operation

Eco-mode

When the digital display is viewed infrequently during operation, current consumption can be reduced by dimming the display or turning it OFF entirely.
(Eco-mode can be set from the Mobile Console only.)

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

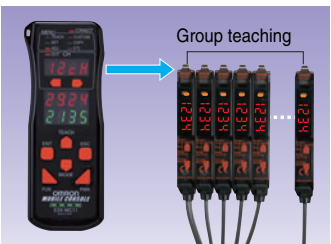### Remote Setting and Adjustment

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

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

Display the light intensity and threshold at the same time.

New Concept
Patent Pending

Function indicator section

Channel setting section

Light intensity monitor

Threshold

Operation keys
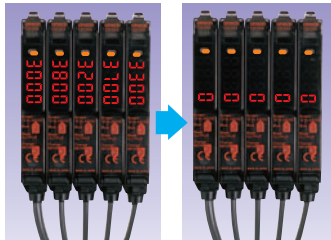
Battery monitor

Head

Optical communications

With group teaching, teach multiple amplifiers simultaneously.

The tedious teaching that had to be performed separately for each Amplifier can now be performed for several Amplifiers at once using the Mobile Console.
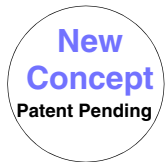
Group teaching

Eliminate inconsistency by using group zero reset.

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

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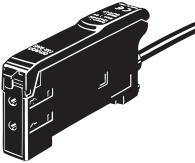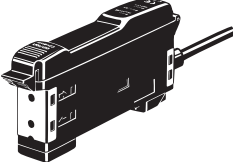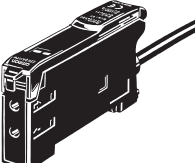
Even if the Amplifier and Sensor head are separated during operation, it is still possible to flash the Sensor head and display the amplifier channels.

Channel 5
Channel 4
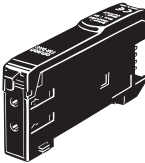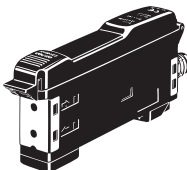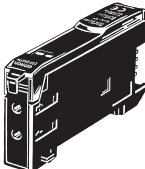Channel 3
Channel 2
Channel 1

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Ordering Information

Amplifiers
Pre-wired Amplifiers

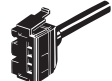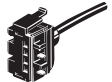| Type	Appearance	Control output	Model	
			NPN output	PNP output
Standard models		ON/OFF output	E3X-DA11-N	E3X-DA41-N
Monitor-output models		• ON/OFF output • Monitor output	E3X-DA21-N	E3X-DA51-N
Mark-detecting models (blue LED)		ON/OFF output	E3X-DAB11-N	E3X-DAB41-N
Mark-detecting models (green LED)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

* For details, refer to page 6.

Amplifiers with Standard Connectors

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

* For details, refer to page 6.

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

Type	Appearance	Cable length	No. of conductors	Model
Master Connector		2 m	3	**E3X-CN11**
			4	**E3X-CN21**
Slave Connector			1	**E3X-CN12**
			2	**E3X-CN22**

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

Refer to the following tables when placing an order.

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

When Using 5 Amplifiers

Amplifiers (5 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	4-wire connection	**XS3F-M421-402-A**
			5 m		**XS3F-M421-405-A**
		L-shaped connector	2 m		**XS3F-M422-402-A**
			5 m		**XS3F-M422-405-A**

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Mobile Console (Order Separately)

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

Accessories (Order Separately)
Mounting Brackets
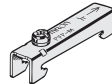
Appearance	Applicable model	Model	Quantity	Remarks
	E3X-DA-N Series	**E39-L143**	1	---
	E3X-DA☐V	**E39-L148**		

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

Operating Instructions Sticker

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

End Plate

Appearance	Model	Quantity
	PFP-M	1

Ratings and Specifications

Amplifiers
Pre-wired Amplifiers

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

Item	Output type	Type	Standard models	Monitor-output models	Mark-detecting models		Infrared models	Water-resistant models	Twin-output models
	NPN output		E3X-DA11-N	E3X-DA21-N	E3X-DAB11-N	E3X-DAG11-N	E3X-DAH11-N	E3X-DA11V	E3X-DA11TW
	PNP output		E3X-DA41-N	E3X-DA51-N	E3X-DAB41-N	E3X-DAG41-N	E3X-DAH41-N	E3X-DA41V	E3X-DA41TW
Ambient temperature			Operating:Groups of 1 to 3 Amplifiers: −25 to 55°C Groups of 4 to 11 Amplifiers: −25 to 50°C Groups of 12 to 16 Amplifiers: −25 to 45°C Storage:−30 to 70°C (with no icing or condensation)						
Ambient humidity			Operating and storage: 35% to 85% (with no condensation)						
Insulation resistance			20 MΩ min. (at 500 VDC)						
Dielectric strength			1,000 VAC at 50/60 Hz for 1 min						
Vibration resistance (destruction)			10 to 55 Hz with a 1.5-mm double amplitude for 2 h each in X, Y and Z directions						
Shock resistance (destruction)			500m/s^2, for 3 times each in X, Y and Z directions						
Degree of protection			IEC IP50 (with Protective Cover attached)					IEC IP66 (with Protective Cover attached)	IEC IP50 (with Protective Cover attached)
Connection method			Pre-wired (standard cable length: 2 m)						
Weight (packed state)			Approx. 100 g					Approx. 110 g	Approx. 100 g
Material	Case		Polybutylene terephthalate (PBT)						
	Cover		Polycarbonate						Polyethersulfone
Accessories			Instruction sheet						

Amplifiers with Connectors
(Specifications different to those for Pre-wired Amplifiers)

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

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

Connectors

Item	Model	E3X-CN11/21/22	E3X-CN12
Rated current		2.5 A	
Rated voltage		50 V	
Contact resistance		20 mΩ max. (20 mVDC max., 100 mA max.) The figure is for connection to the Amplifier and the adjacent Connector. It does not include the conductor resistance of the cable.	
No. of insertions (durability)		50 times The figure for the number of insertions is for connection to the Amplifier and the adjacent Connector.	
Material	Housing	Polybutylene terephthalate (PBT)	
	Contacts	Phosphor bronze/gold-plated nickel	
Weight (packed state)		Approx. 55 g	Approx. 25 g

Mobile Console

Item	Model	E3X-MC11
Power supply voltage		Charged with AC adapter
Connection method		Connected via adapter
Weight (packed state)		Approx. 580 g (Console only: 120 g)

Refer to *Instruction Manual* provided with the Mobile Console for details.

Digital Fiber Amplifiers with Differential Outputs (E3X-DA11D/E3X-DA6D)
Characteristics of Applicable Fiber Units
Through-beam Fiber Units

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

*1. These values are for sensing objects that are moving.
*2. This value applies when the response time is set to 3 to 11. An object of this value is detectable if the temperature changes within the range of ambient operating temperature. (The value is for sensing objects that are moving.)
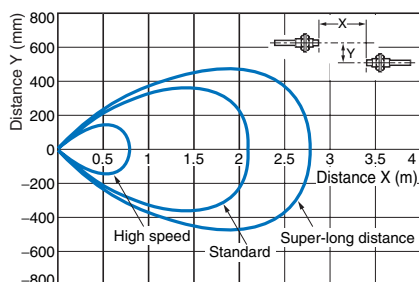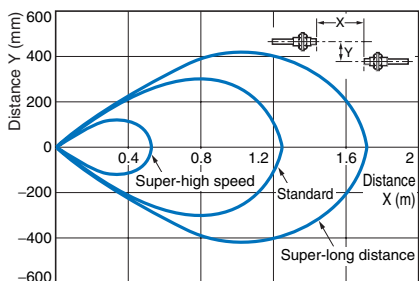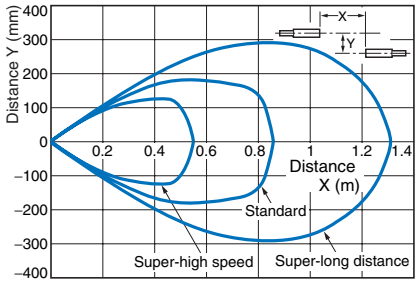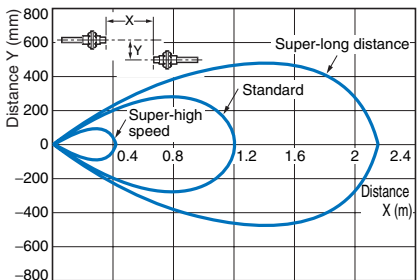*3. The values given in the above table are those that can be detected at a digital value of 1,000 in each sensing area.

Reflective Fiber Units

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

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

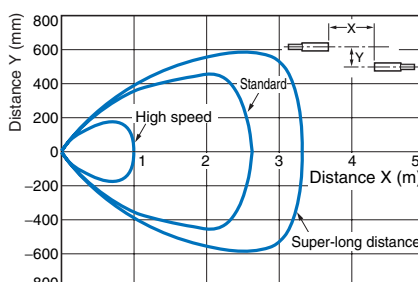### Differences Compared with E3X-DA-N Amplifier

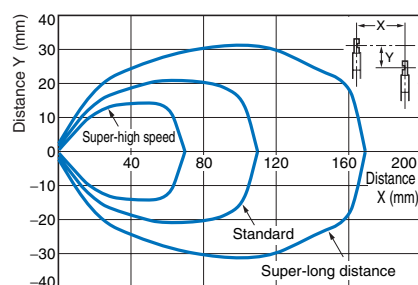|	Type	Differential-output Models (Edge-detection Models)	
		Pre-wired	Wire-saving connector
Item	**NPN output**	E3X-DA11D	E3X-DA6D
Current consumption		960 mW max. (current consumption: 40 mA max. at power supply voltage of 24 VDC)	
Control output	**ON/OFF output**	Load current: 50 mA max., (Residual voltage: 1 V max. for NPN/PNP output) Open collector Switchable between Light ON (ON at edge detection) and Dark ON (OFF at edge detection)	
Detection mode		Switchable between single edge and double edge detection mode	
Response time		Single edge: Can be set to 270 μs, 500 μs, 1 ms, 2 ms, 4 ms, 10 ms, 20 ms, 30 ms, 50 ms, 100 ms, or 200 ms. Double edge: Can be set to 570 μs, 1 ms, 2 ms, 4 ms, 10 ms, 20 ms, 30 ms, 50 ms, 100 ms, 200 ms or 400 ms.	
Functions	**Timer functions**	Light ON: OFF-delay timer, Dark ON: ON-delay timer 0 to 5 s (1 to 20 ms: 1-ms units, 20 to 200 ms: 5-ms units, 200 ms to 1 s: 100 ms, 1 to 5 s: 1-s units)	
	APC	Yes	
	Zero-reset	Yes (Negative values can be displayed.)	
	Initial reset	Yes (Settings can be returned to defaults.)	
	Sensitivity selection	Yes (HIGH/LOW)	
	Teaching level	One-point teaching level can be varied from 1% to 50% in increments of 1%	
Indicators		Operation indicator (orange), 7-segment digital incident level display (red), 7-segment digital detection level display (red)	

For other information, refer to the instruction manual supplied with the product.
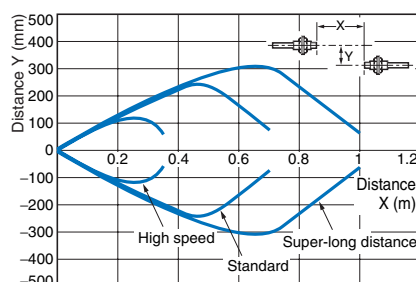
Engineering Data (Typical)

E3X-DA-N/E3X-DA□V/E3X-DA□TW

Parallel Operating Range At maximum sensitivity. (Use for optical axis adjustment at installation.)

Through-beam
E32-T11L

Through-beam
E32-T11L + E39-F1 (separately sold Long-distance Lens Unit)

Through-beam
E32-T12L

Through-beam
E32-TC200

Through-beam
E32-TC200 + E39-F1 (separately sold Long-distance Lens Unit)
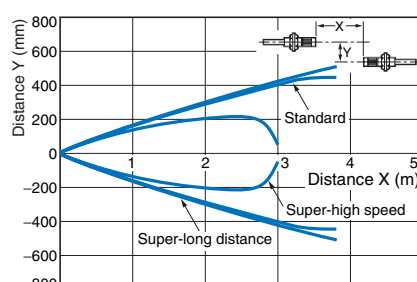
Through-beam
E32-T11R

Through-beam
E32-T12R
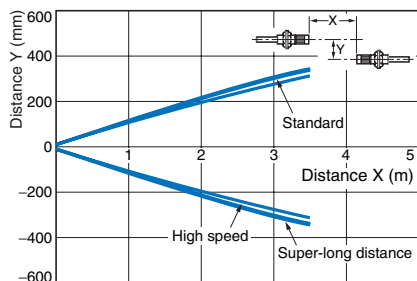
Through-beam
E32-T21R
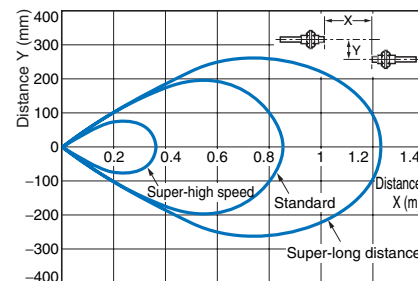
Through-beam
E32-T22R

Through-beam
E32-T11

Through-beam
E32-T22B
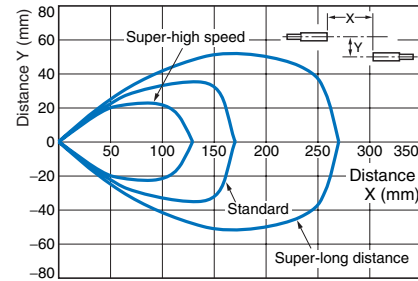
Through-beam
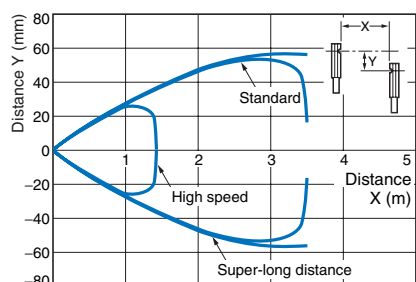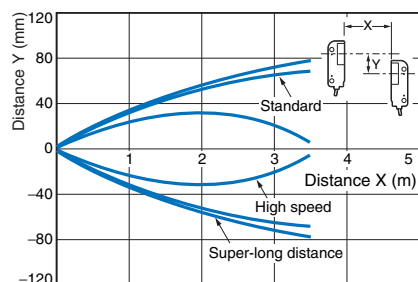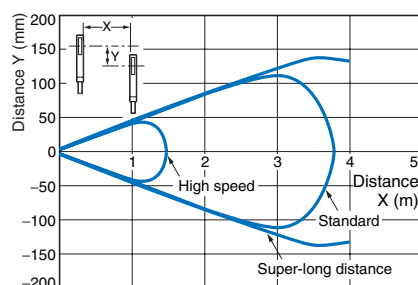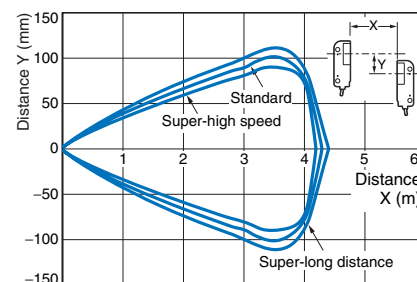**E32-T14LR**
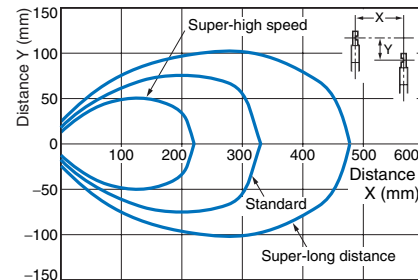
Through-beam
E32-T24R

Distance Y (mm)
Super-high speed
Standard
Super-long distance
Distance X (mm)

Through-beam
E32-T81R

Distance Y (mm)
High speed
Standard
Super-long distance
Distance X (mm)

Through-beam
E32-T51

Distance Y (mm)
High speed
Standard
Super-long distance
Distance X (m)

Through-beam
E32-T61

Distance Y (mm)
High speed
Standard
Super-long distance
Distance X (m)
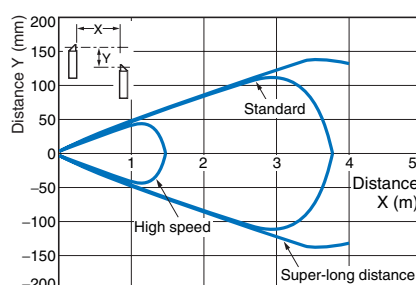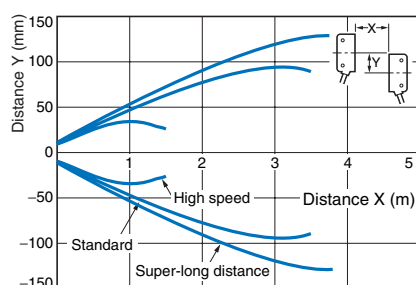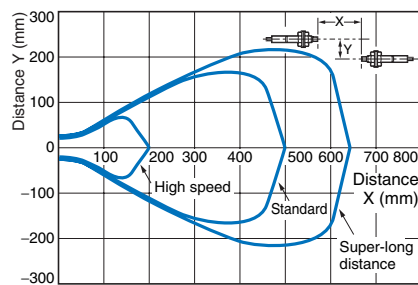
Through-beam
E32-T61 + E39-F1 (separately sold Long-distance Lens Unit)

Distance Y (mm)
Standard
High speed
Super-long distance
Distance X (m)

Through-beam
E32-T22S

Distance Y (mm)
Standard
High speed
Super-long distance
Distance X (m)

Through-beam
E32-T24S

Distance Y (mm)
Standard
High speed
Super-long distance
Distance X (m)

Through-beam
E32-T16W

Distance Y (mm)
Standard
High speed
Super-long distance
Distance X (m)

Through-beam
E32-T16WR

Distance Y (mm)
Standard
Super-high speed
Super-long distance
Distance X (m)

Through-beam
E32-T16J

Distance Y (mm)
Standard
High speed
Super-long distance
Distance X (m)

Through-beam
E32-T16J

Distance Y (mm)
High speed
Standard
Super-long distance
Distance X (m)

Through-beam
E32-T16JR

Distance Y (mm)
Super-high speed
Standard
Super-long distance
Distance X (m)

Through-beam
E32-T16P

Distance Y (mm)
High speed
Standard
Super-long distance
Distance X (m)

Through-beam
E32-T16PR

Distance Y (mm)
Standard
Super-high speed
Super-long distance
Distance X (m)
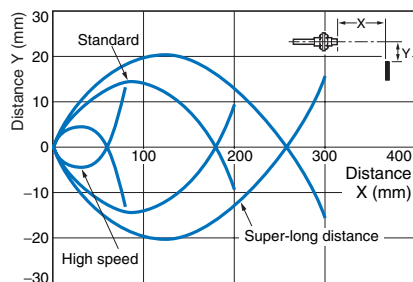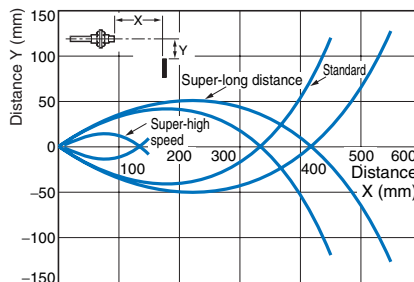
Operating Range With standard sensing object at maximum sensitivity. (Use for the positioning of the object and Sensor.)

Reflective
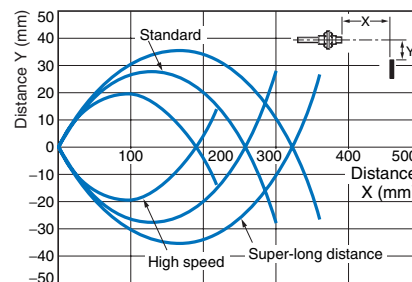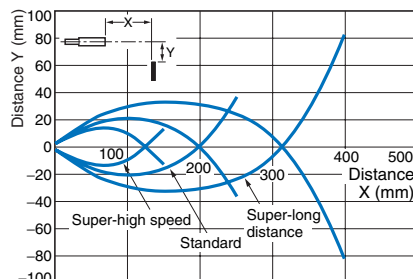**E32-D21L**

Reflective
E32-DC200

Reflective
E32-D11R

Reflective
E32-D12R

Reflective
E32-D21R
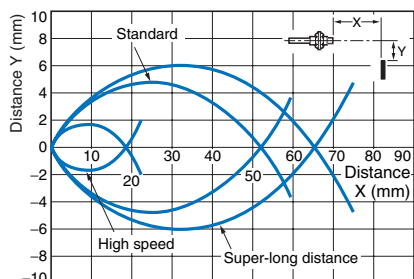
Reflective
E32-D22R
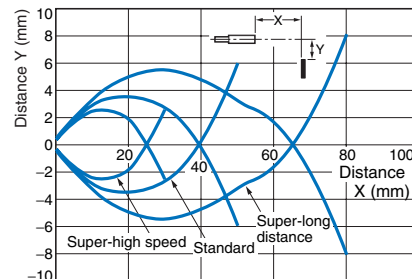
Reflective
E32-D33
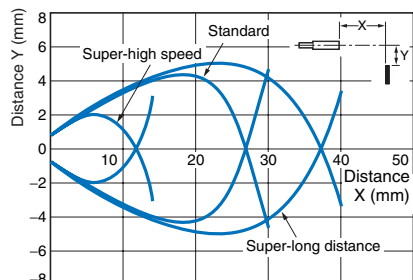
Reflective
E32-D331
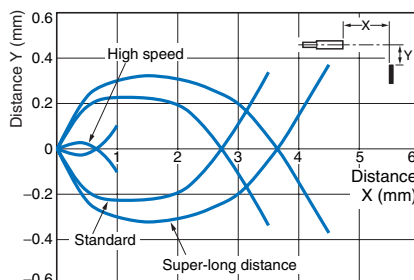
Reflective
E32-D21B
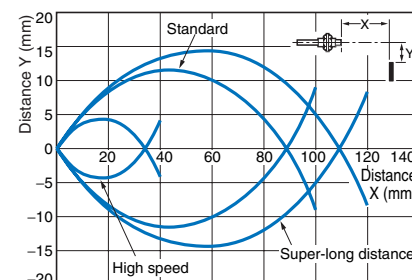
Reflective
E32-D22B
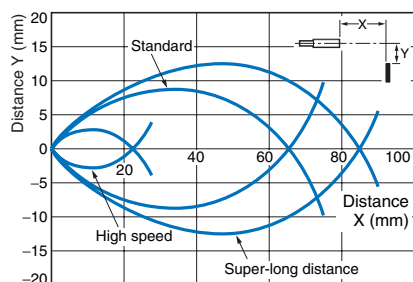
Reflective
E32-C31
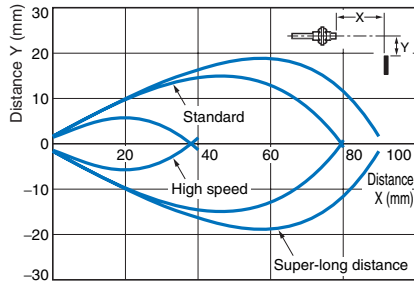
Reflective
E32-C41
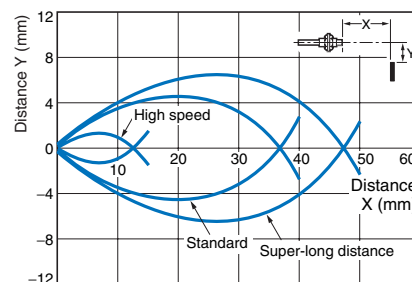
Reflective
E32-C42
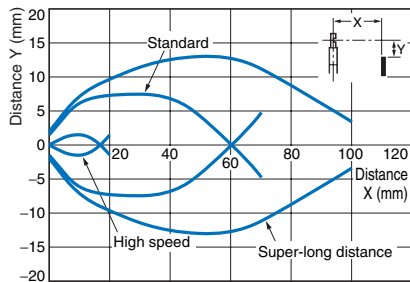
Reflective
E32-D32

Reflective
E32-D14LR

Reflective
E32-D24
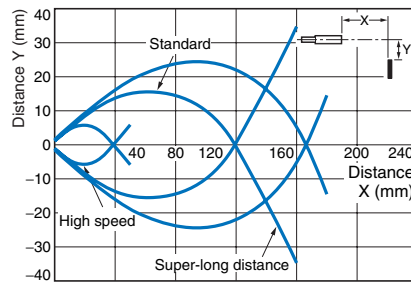
Reflective
E32-D24R
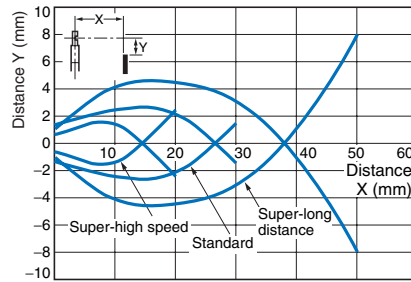
Reflective
E32-D61

Reflective
E32-D36P1

Reflective
E32-D36P1

Reflective
E32-L56E□

Limited Reflective
E32-L25L
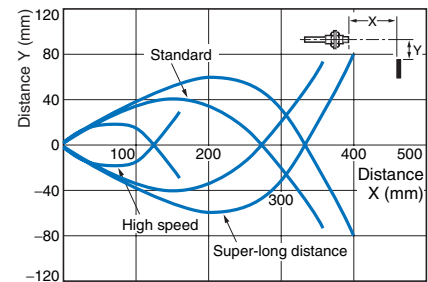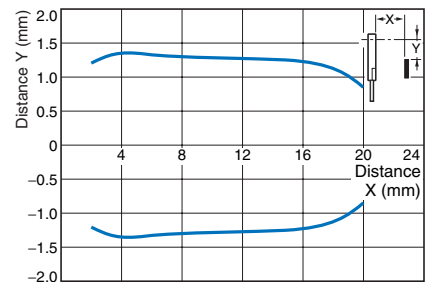
Excess Gain Ratio vs. Distance With standard sensing object at maximum sensitivity.

Through-beam
E32-TC200
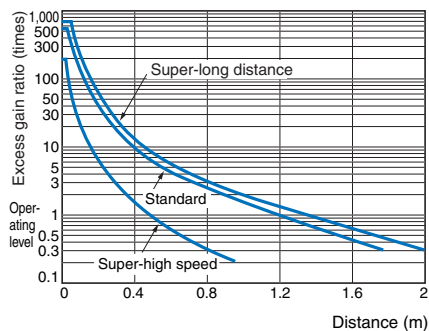
Reflective
E32-DC200
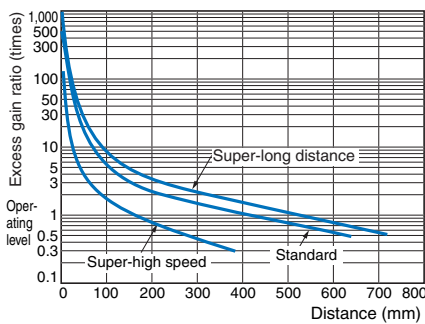
Reflective
E32-D21L
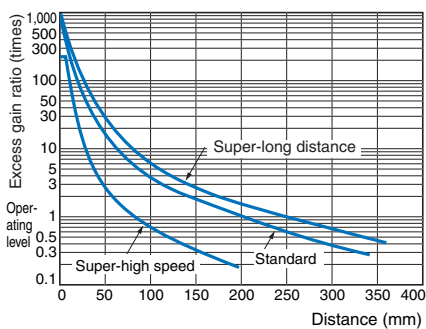
Operating Range
Reflective
E32-DC200
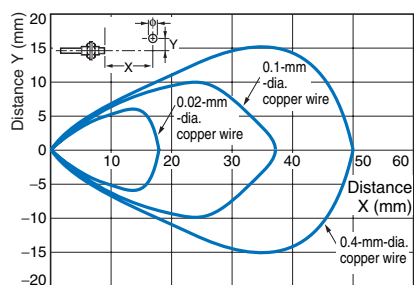
Hysteresis vs. Sensing Distance
Reflective
E32-D11L
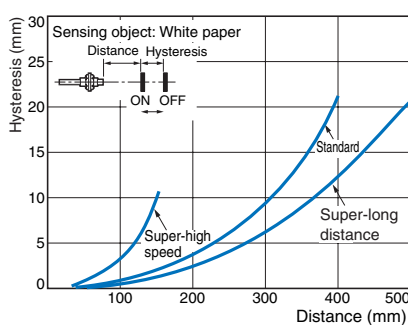
Repeat Accuracy vs. Sensing Distance
Reflective
E32-DC200
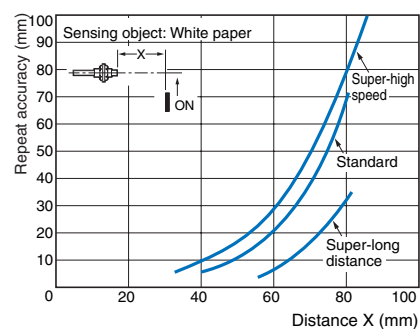
E3X-DA-N

Monitor Output vs. Distance (Standard Mode)

Through-beam
E32-TC200
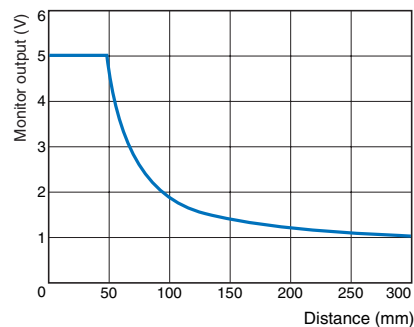
Reflective
E32-DC200
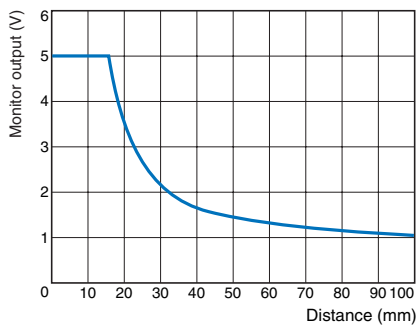
E3X-DAB-N/E3X-DAG-N

Parallel Operating Range At maximum sensitivity. (Use for optical axis adjustment at installation.)

Through-beam
E32-TC200
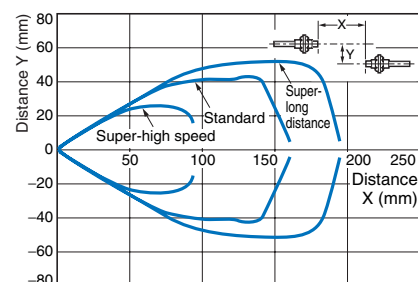
Through-beam
E32-TC200 + E39-F1(separately sold Long-distance Lens Unit)
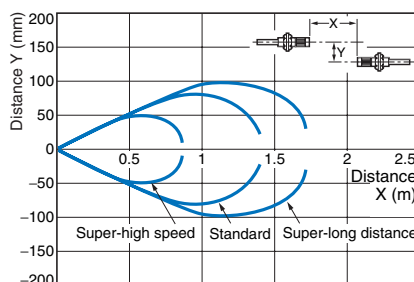
Operating Range With standard sensing object at maximum sensitivity. (Use for the positioning of the object and Sensor.)

Reflective
E32-DC200
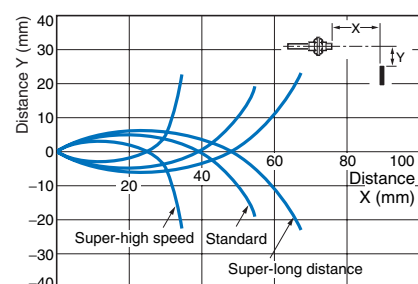
Reflective
E32-CC200
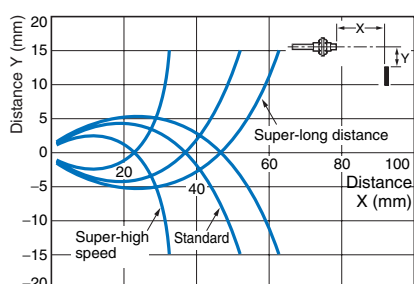
Limited Reflective
E32-D11L
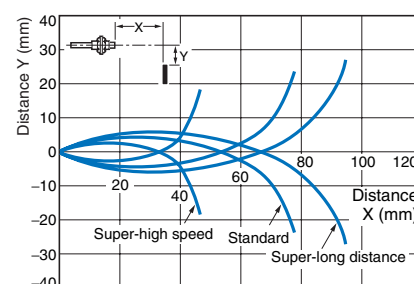
E3X-DAH-N

Parallel Operating Range At maximum sensitivity. (Use for optical axis adjustment at installation.)

Through-beam
E32-TC200
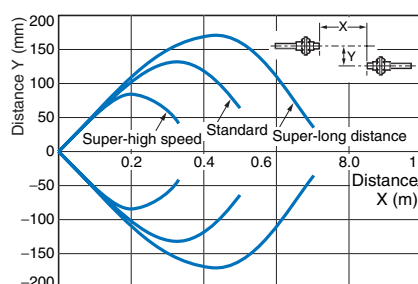
Through-beam
E32-T11L
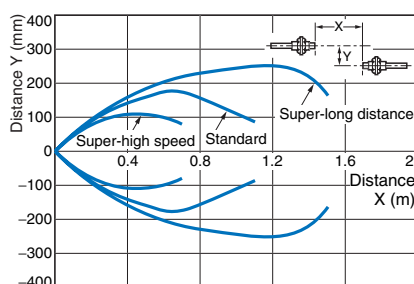
Through-beam
E32-T14
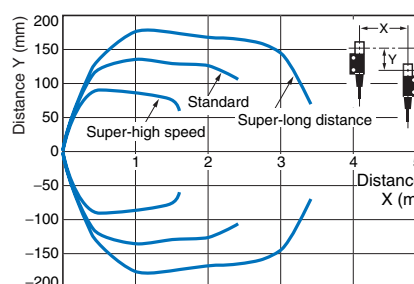
Operating Range With standard sensing object at maximum sensitivity. (Use for the positioning of the object and Sensor.)

Reflective
E32-DC200
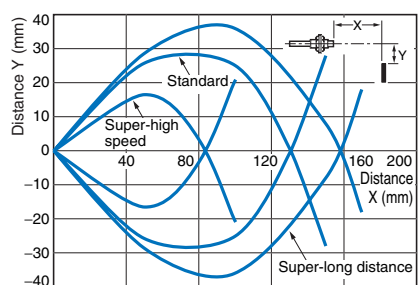
Reflective
E32-D11L
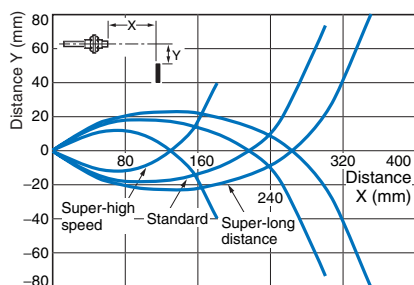
Limited Reflective
E32-CC200
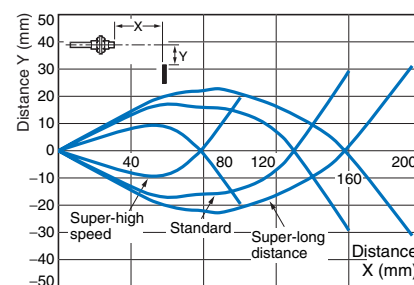
For other information on Fiber Units, refer to the Fiber Sensors Best Selection Catalog (Cat. No. E353).

Technical Reference (for E3X-DA-TW Twin-output Models)

Output Patterns for Normal Operation

Outputs 1 and 2 can be set to operate independently and either Light ON mode or Dark ON mode can be selected (independently) for channels 1 and 2 making a total of 4 possible output patterns.
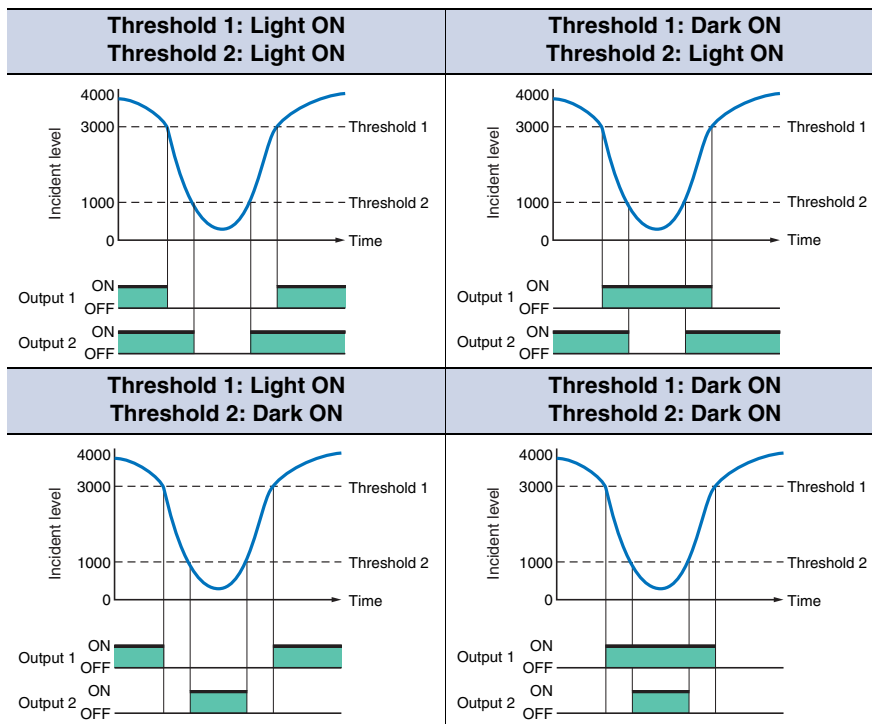
Output Patterns for Area Sensing

This series includes models equipped with area sensing functionality, a first for Digital Fiber Amplifiers. This functionality can be used to monitor whether the incident level is inside or outside the threshold area. The 2 output patterns below are possible for this kind of operation.
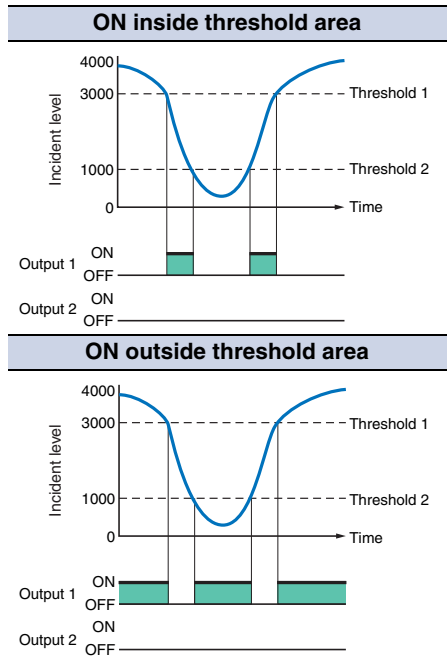
Note: Output 2 is always OFF.

OMRON

15

I/O Circuit Diagrams

NPN Output

Model	Operation mode	Timing charts	Mode selector switch	Output circuit
E3X-DA11-N E3X-DAB11-N E3X-DAG11-N E3X-DAH11-N E3X-DA11V E3X-DA6 E3X-DAB6 E3X-DAG6 E3X-DAH6 E3X-DA14V	Light-ON	Incident light / No incident light Operation indicator (orange) ON/OFF Output transistor ON/OFF Load (e.g., relay) Operate/Reset (Between brown and black)	L-ON (LIGHT ON)	
	Dark-ON	Incident light / No incident light Operation indicator (orange) ON/OFF Output transistor ON/OFF Load (e.g., relay) Operate/Reset (Between brown and black)	D-ON (DARK ON)	• Connector Pin Arrangement (M-8 Connector only) Note: Pin 2 is not used.
E3X-DA21-N E3X-DA7	Light-ON	Incident light / No incident light Operation indicator (orange) ON/OFF Output transistor ON/OFF Load (e.g., relay) Operate/Reset (Between brown and black)	L-ON (LIGHT ON)	
	Dark-ON	Incident light / No incident light Operation indicator (orange) ON/OFF Output transistor ON/OFF Load (e.g., relay) Operate/Reset (Between brown and black)	D-ON (DARK ON)	* Load resistance: 10 kΩ min.
E3X-DA11TW E3X-DA6TW	Light-ON	CH1/CH2 Incident light / No incident light Operation indicator (orange) ON/OFF Output transistor ON/OFF Load (e.g., relay) Operate/Reset (Between brown and black)	L-ON (LIGHT ON)	
	Dark-ON	CH1/CH2 Incident light / No incident light Operation indicator (orange) ON/OFF Output transistor ON/OFF Load (e.g., relay) Operate/Reset (Between brown and black)	D-ON (DARK ON)	

Note: With E3X-DA☐TW models, only channel 1 is output when set for area sensing operation.
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. (Channel 2 is always OFF.)

Sensor I/O Connectors for Models with M8 Connectors

XS3F-M421-402-A
XS3F-M421-405-A
XS3F-M422-402-A
XS3F-M422-405-A

Classification	Wire colors	Connection pin No.	Application
DC	Brown	1	Power supply (+V)
	White	2	---
	Blue	3	Power supply (0 V)
	Black	4	Output

Note: Pin 2 is not used.

PNP Output

Model	Operation mode	Timing charts	Mode selection switch	Output circuit
E3X-DA41-N E3X-DAB41-N E3X-DAG41-N E3X-DAH41-N E3X-DA41V E3X-DA8 E3X-DAB8 E3X-DAG8 E3X-DAH8 E3X-DA44V	Light-ON	Incident light / No incident light / Operation indicator (orange) ON OFF / Output transistor ON OFF / Load (e.g., relay) Operate Reset (Between blue and black)	L-ON (LIGHT ON)	• Connector Pin Arrangement (M-8 Connector only) Note: Pin 2 is not used.
	Dark-ON	Incident light / No incident light / Operation indicator (orange) ON OFF / Output transistor ON OFF / Load (e.g., relay) Operate Reset (Between blue and black)	D-ON (DARK ON)	
E3X-DA51-N E3X-DA9	Light-ON	Incident light / No incident light / Operation indicator (orange) ON OFF / Output transistor ON OFF / Load (e.g., relay) Operate Reset (Between blue and black)	L-ON (LIGHT ON)	* Load resistance: 10 kΩ min.
	Dark-ON	Incident light / No incident light / Operation indicator (orange) ON OFF / Output transistor ON OFF / Load (e.g., relay) Operate Reset (Between blue and black)	D-ON (DARK ON)	
E3X-DA41TW E3X-DA8TW	Light-ON	CH1/CH2 Incident light / No incident light / Operation indicator (orange) ON OFF / Output transistor ON OFF / Load (e.g., relay) Operate Reset (Between blue and black)	L-ON (LIGHT ON)	
	Dark-ON	CH1/CH2 Incident light / No incident light / Operation indicator (orange) ON OFF / Output transistor ON OFF / Load (e.g., relay) Operate Reset (Between blue and black)	D-ON (DARK ON)	

Note: With E3X-DA☐TW models, only channel 1 is output when set for area sensing operation.
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. (Channel 2 is always OFF.)

Sensor I/O Connectors for Models with M8 Connectors

Wire colors
Brown
White
Blue
Black

XS3F-M421-402-A
XS3F-M421-405-A
XS3F-M422-402-A
XS3F-M422-405-A

Classification	Wire colors	Connection pin No.	Application
DC	Brown	1	Power supply (+V)
	White	2	---
	Blue	3	Power supply (0 V)
	Black	4	Output

Note: Pin 2 is not used.

Connection

Connection with K3NX-VD2☐ Process Meter
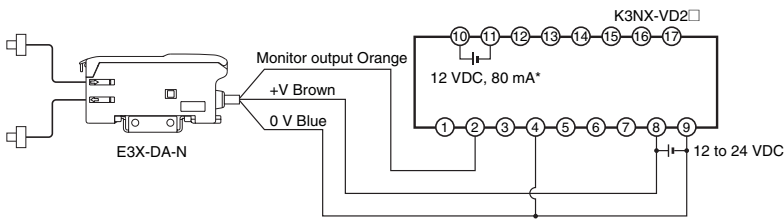
Note 1. Various I/O Units are available for the K3NX. Select an appropriate output type depending on the application.
2. This wiring is for the K3NX with DC power supply specifications and the Monitor (Analog) Sensor with DC power supply specifications. Check respective power supply specifications before wiring.
* Use this service power supply for the Sensor with reference to the power consumption of each Sensor.

Nomenclature

Amplifiers

Standard, Monitor-output, Mark-detecting, Infrared, and Water-resistant Models

Lock Button

Level Display

Setting Buttons
TEACH
MODE

Operation Indicator
ON when output is ON.
OFF when output is OFF.

Mode Selector
Use to select SET, ADJ, or RUN mode.

Operating Mode Selector
Use to switch between Light ON and Dark ON modes.

Twin-output Models

Lock Button

Level Display

Setting Buttons
TEACH
MODE

Operation Indicator
ON when output is ON.

Mode Selector
Use to select SET, ADJ, or RUN mode.

Channel-selection Switch
Use to switch between channels 1 and 2.

Amplifier Adjustments

All Models

1 Changing the Display (RUN Mode)

Set the mode selector to RUN.

RUN

(Factory-set to RUN)

→

Digital incident level (4000 max.)

0 **4000**

↓ 2 s MODE

Digital percent

0 **123P**

↓ 2 s MODE

Analog incident level and threshold

0 |ıııİııı|

↓ 2 s MODE
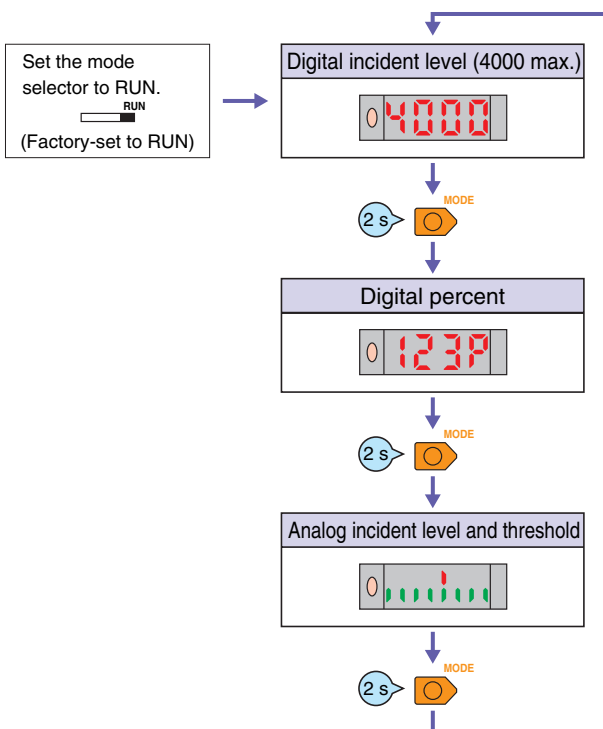
Manual Tuning (Fine Sensitivity Adjustment) in ADJ Mode

Perform fine sensitivity adjustment after teaching and manual tuning (without using the teaching function) in the way shown below:

Twin-output Models

First, select the channel to be adjusted using the channel selection switch.

CH1 ▭ CH2

Set the mode selector to ADJ.

ADJ

→

Fine sensitivity adjustment

TEACH   MODE

Sensitivity increment with threshold decrement

Sensitivity decrement with threshold increment
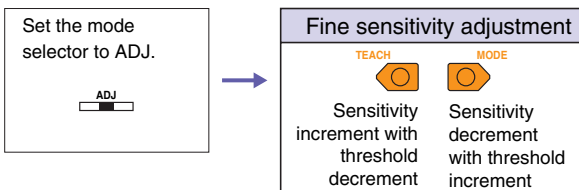
The items displayed in ADJ mode vary with the display setting in RUN mode.

RUN mode	ADJ mode
Digital incident level	→ Digital threshold
Digital percent	→ Digital percent
Analog value	→ Analog value

2 Zero-reset (RUN Mode)

Set the mode selector to RUN.

RUN

→

Digital incident level (4000 max.)

0 **4000**

↓

TEACH * ◯ ◁ 1 s

To reset to zero again:

↓

TEACH ◯ ◁ 1 s

To return the initial digital incident level:

↓

TEACH   MODE

Hold down both for 3 s.

*There is no limit on the number of times zero-reset can be used.

3 Initial Reset (SET Mode)

Set the mode selector to SET.

SET

↓

TEACH   MODE

Hold down both for 5 s.

↓

TEACH ◯

0 **n0 ?** ↔ 0 **YES?**

↓ MODE   ↓ MODE

Cancel   Execute initial reset

4 Setting Functions in SET Mode

Set mode selector to SET.

SET

Digital incident level display

Teaching

Four types of sensitivity settings are available. Refer to page 22 for details.

2 s MODE

| Sensing function | Displayed as "F." |

Standard (factory-set) — `F St`

TEACH

Super-long distance — `F Ld`

TEACH

Super-high speed — `F HS`

TEACH

2 s MODE

| Timer function | Displayed as "t." |

0 (Factory-set) — `t 0`

TEACH

Adjustable in 1-ms units for 0 to 20 ms and in 5-ms units for 25 ms or higher.

200 — `t200`

TEACH

2 s MODE

| Flashing setting | Displayed as "L." |

OFF (Factory-set) — `LOFF`

TEACH

ON — `L On`

TEACH

2 s MODE

| Hold setting | Displayed as "H." |

OFF (Factory-set) — `HOFF`

TEACH

Peak — `H PE`

TEACH

Bottom — `H bO`

TEACH

2 s MODE

| Display orientation setting | Reversing display |

Standard (factory-set) — `d123`

TEACH

Reverse — `dE21`

TEACH

Ⓑ   Ⓐ

| Monitor Focus | Available with: E3X-DA21-N / E3X-DA51-N / E3X-DA7 / E3X-DA9 |

Ⓑ   Ⓐ

2 s MODE

| Setting upper limit for monitoring | Alternates between "A-UP" and setting value. |

(Factory setting)

`A-UP` ←Alternates→ `4000`

In units of 100 from 4,000.

TEACH

`A-UP` ←Alternates→ `3900`

TEACH

`A-UP` ←Alternates→ `200`

TEACH

`A-UP` ←Alternates→ `100`

TEACH

Note: It is not possible to set an upper limit that is lower than the lower limit.

MODE

| Setting lower limit for monitoring | Alternates between "A-LO" and setting value. |

(Factory setting)

`A-LO` ←Alternates→ `0`

In units of 100 from 0

TEACH

`A-LO` ←Alternates→ `100`

TEACH

`A-LO` ←Alternates→ `3800`

TEACH

`A-LO` ←Alternates→ `3900`

TEACH

Note: It is not possible to set an lower limit that is lower than the lower limit.

Twin-output Models

4 Setting Functions (SET Mode)

Set mode selector to SET.

SET

Digital incident level display

→ Teaching

Four types of sensitivity settings are available. Refer to page 22 for details.

Setting the operating mode | Changing the operating mode

The operating mode for the channel set with the channel-selection switch can be changed.

Changed using the channel-selection switch

CH1 ◼▭ **CH2**

Channel 1 ⟷ Channel 2

L-ON `1 L0n`   L-ON `2L0n`
(Factory setting)   (Factory setting)
TEACH   TEACH

D-ON `1 d0n`   D-ON `2d0n`

(2 s) MODE

Sensing function | Displayed as "F."

Standard (factory-set) `F 5t`
TEACH

Super-long distance `F Ld`
TEACH

Super-high speed `F H5`
TEACH

Area `F Ar`
TEACH

Ⓑ   Ⓐ

Ⓑ   Ⓐ

(2 s) MODE

Timer function | Displayed as "t."

(Factory setting) `t    0`
TEACH

Adjustable in 1-ms units for 0 to 20 ms and in 5-ms units for 25 ms or higher.

200 `t200`
TEACH

(2 s) MODE

Flashing setting | Displayed as "L."

OFF (factory-set) `L0FF`
TEACH

ON `L 0n`
TEACH

(2 s) MODE

Hold setting | Displayed as "H."

OFF (factory-set) `H0FF`
TEACH

Peak `H PE`
TEACH

Bottom `H b0`
TEACH

(2 s) MODE

Display orientation setting | Reversing display

Standard (factory-set) `d123`
TEACH

Reverse `dE21`
TEACH

● Area Sensing

Area sensing is possible using the threshold values for channels 1 and 2.

- If channel 1 is set to L-ON, output turns ON when the incident level is between the thresholds.
- If channel 1 is set to D-ON, output turns OFF when the incident level is between the thresholds.

The result is output to control output 1.

(Control output 2 is always OFF.)

All Models

Teaching (SET Mode)

- The four types of teaching given below are available.
- Once the setting is made, the Amplifier operates according to the settings. The red level display will flash if a teaching error occurs. In that case, repeat the whole teaching procedure.

With twin-output models, switch to the channel to be adjusted using the channel-selection switch.	CH1 ▣▬ CH2

Set the mode selector to SET to start teaching.	SET ▣▬

Maximum Sensitivity Setting

Step	Operation	
1	Set the mode selector to SET.	SET ▣▬
2	Press the TEACH button for at least 3 seconds.	TEACH ⬤ 3 s
3	Setting is complete when the level display changes from red to green. The level display will display the digital incident level later.	(Red) ↓ (Green)
4	Set to RUN mode.	RUN ▬▣

One-point Without-object Teaching

Step	Operation	
1	Set the mode selector to SET.	SET ▣▬
2	Press the TEACH button for approximately 1 second.	TEACH ⬤ 1 s
3	Teaching is complete when the red level display is lit. The level display will display the digital incident level later.	(Red)
4	Set to RUN mode.	RUN ▬▣
5	The threshold is automatically set with the object.	Object → Output ON

Note: If one-point teaching is not available because the difference in level is too fine, try two-point teaching.

Operating Mode Selector

Operating mode		Operation
Light-ON	L-ON	L ▣▬ (Factory-set)
Dark-ON	D-ON	▬▣ D

Note: There is no operating mode selector for twin-output models.

Two-point With/Without-object Teaching

Step	Operation	
1	Set the mode selector to SET.	SET ▣▬
2	Press the TEACH button for approximately 1 second when the object is at the sensing position.	Object TEACH ⬤ 1 s
3	The red level display is lit.	(Red)
4	Press the TEACH button for approximately 1 second with no object.	TEACH ⬤ 1 s
5	Teaching is complete when the green level display is lit. The level display will display the digital incident level later.	(Green)
6	Set to RUN mode.	RUN ▬▣

Note: The order of "with-object" and "without-object" setting steps above can be reversed.

Pin-point Teaching (for Positioning)

Step	Operation	
1	Set the mode selector to SET.	SET ▣▬
2	Press the TEACH button for approximately 1 second with no object.	TEACH ⬤ 1 s
3	The red level display is lit.	(Red)
4	Place the object in the desired position, and press the TEACH button for at least 3 seconds.	Object → TEACH ⬤ 3 s
5	Teaching is complete when the green level display is lit. The level display will display the digital incident level later. (The red level display will flash if a teaching error occurs.)	(Green)
6	Set to RUN mode.	RUN ▬▣

Safety Precautions

⚠ WARNING
This product is not designed or rated for ensuring safety of persons. Do not use it for such purpose.

Precautions for Correct Use

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

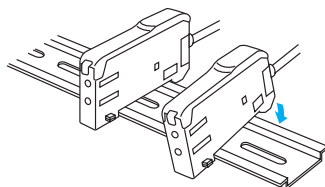## Amplifiers

● 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.

● Mounting

Joining and Separating Amplifiers

Joining Amplifiers

(1) Mount the Amplifiers one at a time onto the DIN track.

(2) Slide the Amplifiers together, line up the clips, and press the Amplifiers together until they click into place.

Clip   Click into place
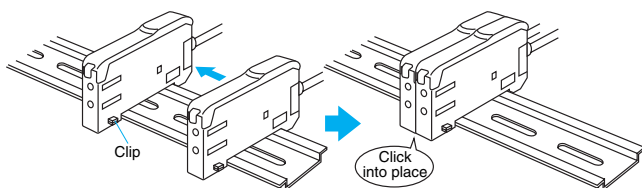
Separating Amplifiers

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

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

Fiber Connection and Disconnection

The E3X Amplifier uses a one-touch locking mechanism. (Only the E3X-NM uses a locking button mechanism.) Connect or disconnect the fibers to or from the E3X Amplifier 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, and lower the lock button.

Lock button   Insertion position

Fiber   Fiber insertion mark   10.7 mm
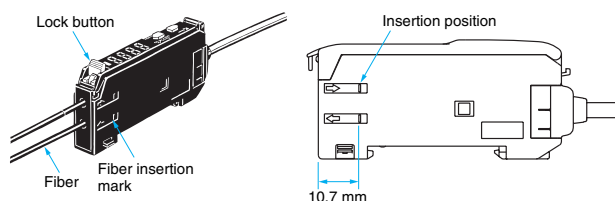
(2) Disconnection

Remove the protective cover and raise the lock button to pull out the fiber.


Protective cover

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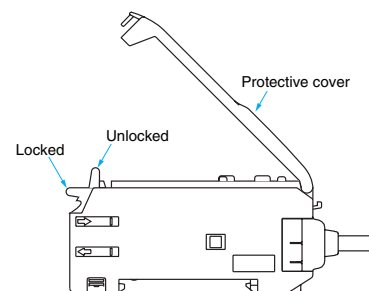
Note: To maintain the fiber properties, confirm that the lock is released before removing the fiber.

(3) Precautions for Fiber Connection/Disconnection

Be sure to lock or unlock the lock button within an ambient temperature range between −10 and 40°C.

Mounting the Mobile Console Head

Leave a gap of at least 20 mm between the nearest Amplifier and the Mobile Console head.

20 mm
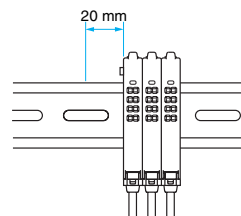
Mounting the Mobile Console Head

With Twin-output models (E3X-DA☐☐TW), up to 16 channels (i.e., eight E3X-DA☐☐TW Amplifiers) can be set using the E3X-MC11 Mobile Console. (Operating modes and area detection, however, cannot be set.)

● Adjustment

Mutual Interference Protection Function

There may be some instability in the digital display values due to light from other sensors. If this occurs, decrease the sensitivity (i.e., increase the threshold) to perform stable detection.

EEPROM Writing Error

If the data is not written to the EEPROM correctly due to a power failure during teaching or static-electric noise, repeat the whole teaching procedure.

Optical Communications

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

Hysteresis Adjustment

The hysteresis setting can be adjusted using the Mobile Console. Do not, however, set the hysteresis to a value lower than the factory setting. Using a setting less than the factory setting may result in incorrect operation.
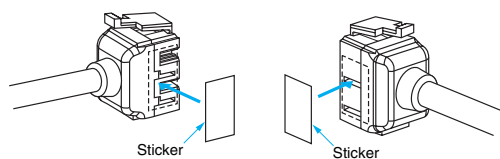
Amplifiers with Connectors
● **Mounting**

Mounting Connectors

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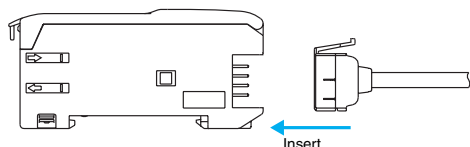
Insert

(2) Join Amplifiers 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.

Sticker

Sticker

Note: Attach the stickers to the sides with grooves.

Removing Connectors

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

(2) After the Amplifier(s) 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 Amplifiers first.)

Press down
Lever
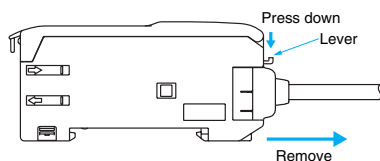
Remove

Mounting End Plate (PFP-M)

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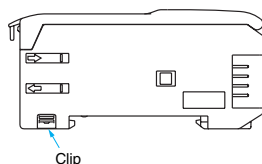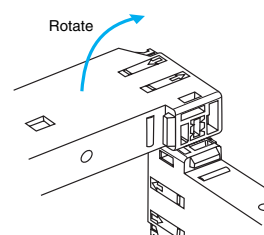

Clip

The clip can also be removed using the following mechanism, which is incorporated in the construction of the section underneath the clip.
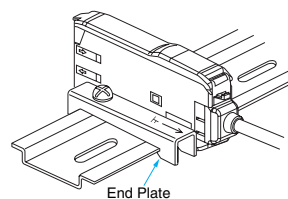
(1) Insert the clip to be removed into the slit underneath the clip on another Amplifier.
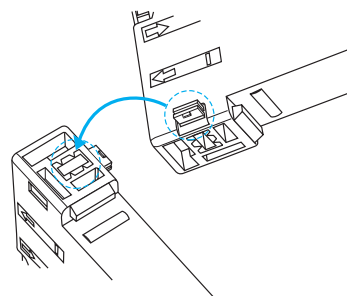
(2) Remove the clip by rotating the Amplifier.

Rotate

When using the E3X-DA-N with the Mobile Console, mount the End Plate in the way shown below.

End Plate

Pull Strengths for Connectors (Including Cables)
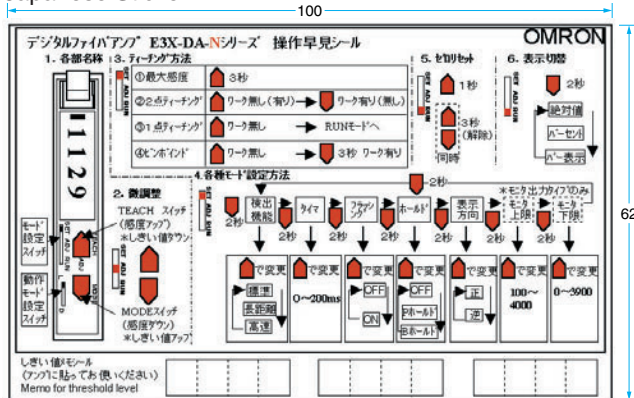
E3X-CN11, E3X-CN21, E3X-CN22: 30 N max.
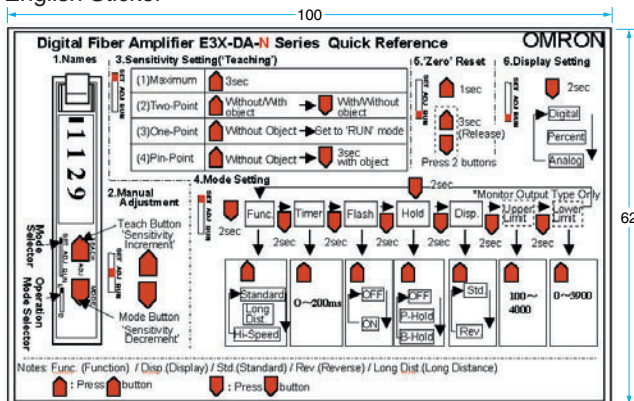E3X-CN12: 12 N max.

Accessories
Operating Instructions Sticker E39-Y1
- Attach near the Sensor.
- 1 English and 1 Japanese sticker per set
- Material: Front side: Paper, Reverse side: Adhesive tape
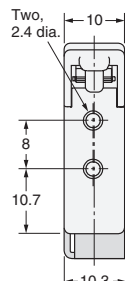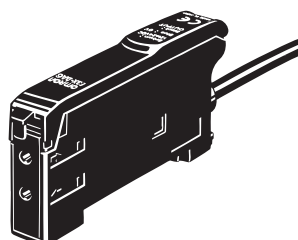
Japanese Sticker

English Sticker

(Unit: mm)

Dimensions

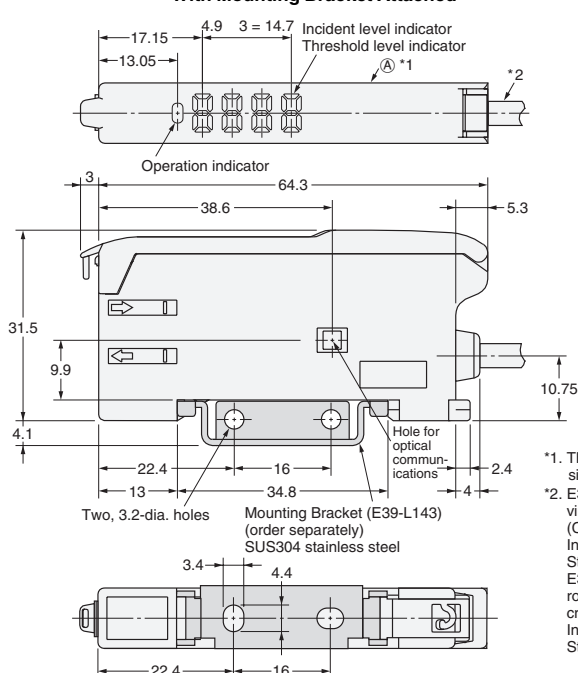Unless otherwise specified, the tolerance class IT16 is used for dimensions in this data sheet.

Pre-wired Amplifiers

E3X-DA11-N	E3X-DAG11-N
E3X-DA21-N	E3X-DAH11-N
E3X-DAB11-N	E3X-DAB41-N
E3X-DA41-N	E3X-DAG41-N
E3X-DA51-N	E3X-DAH41-N
E3X-DA11D	

With Mounting Bracket Attached

Incident level indicator
Threshold level indicator
Ⓐ *1
*2
Operation indicator

17.15
13.05
4.9
3 = 14.7

3
64.3
38.6
5.3
31.5
9.9
4.1
22.4
16
10.75
2.4
13
34.8
4

Two, 3.2-dia. holes
Hole for optical communications

Mounting Bracket (E39-L143) (order separately)
SUS304 stainless steel

Two, 2.4 dia.
10
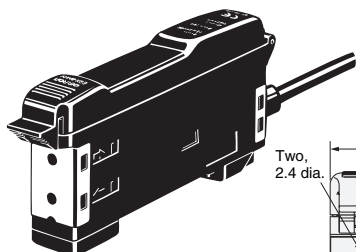8
10.7
10.3

3.4
4.4
22.4
16

Mounting Holes

Two, M3
16
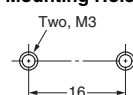
*1. The Mounting Bracket can also be used on side A.
*2. E3X-DA11-N/DA41-N/DAB11-N: 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm^2; Insulationdiameter: 1.1 mm). Standard length: 2 m.
E3X-DA21-N/DA51-N: 4-dia. vinyl-insulated round cable with 4 conductors (Conductor cross section: 0.2 mm^2; Insulation diameter:1.1 mm). Standard length: 2 m.
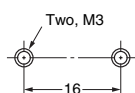
Note: When using E39-L143 Mounting Brackets, there will be small gaps between the Amplifier Units if they are mounted side by side.
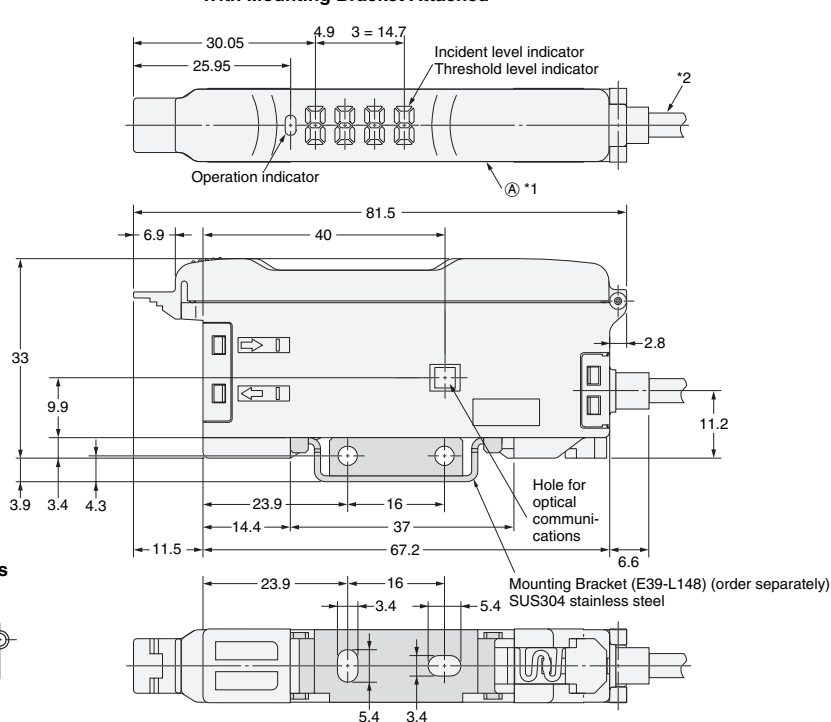
Pre-wired Amplifiers, Water-resistant Models
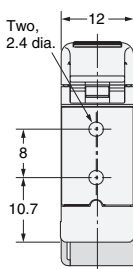
E3X-DA11V
E3X-DA41V

With Mounting Bracket Attached

Incident level indicator
Threshold level indicator
*2
Operation indicator
Ⓐ *1

30.05
25.95
4.9
3 = 14.7

81.5
6.9
40
2.8
33
9.9
11.2
3.9
3.4
4.3
23.9
16
14.4
37
11.5
67.2
6.6

Hole for optical communications

23.9
16
3.4
5.4

Mounting Bracket (E39-L148) (order separately)
SUS304 stainless steel
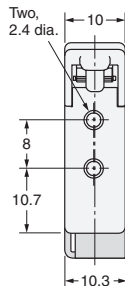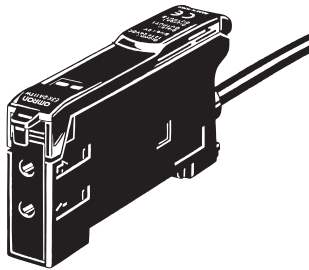
5.4
3.4

Two, 2.4 dia.
12
8
10.7

Mounting Holes

Two, M3
16

*1. The Mounting Bracket can also be used on side A.
*2. 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm^2; Insulation diameter: 1.1 mm). Standard length: 2 m.
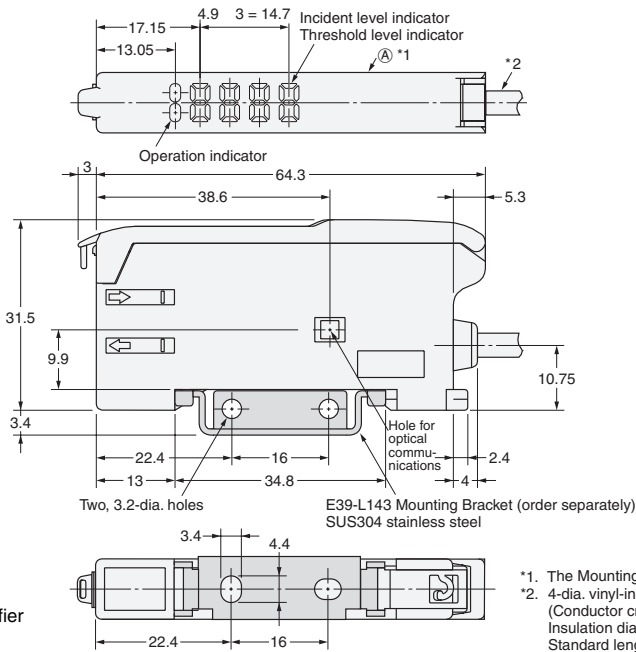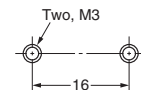
Pre-wired Amplifiers, Twin-output Models
E3X-DA11TW
E3X-DA41TW

With Mounting Bracket Attached

17.15
4.9 3 = 14.7
13.05

Incident level indicator
Threshold level indicator
Ⓐ *1
*2

Operation indicator

3
64.3
38.6
5.3

Mounting Holes
Two, M3

31.5
9.9
3.4

Two,
2.4 dia.
10
8
10.7
10.3

10.75
16

22.4 16
13 34.8
2.4
4

Hole for optical communications

Two, 3.2-dia. holes

E39-L143 Mounting Bracket (order separately)
SUS304 stainless steel

Note: When using E39-L143 Mounting Brackets, there will be small gaps between the Amplifier Units if they are mounted side by side.

3.4 4.4
22.4 16

*1. The Mounting Bracket can also be used on side A.
*2. 4-dia. vinyl-insulated round cable with 4 conductors (Conductor cross section: 0.2 mm²; Insulation diameter: 1.1 mm). Standard length: 2 m.
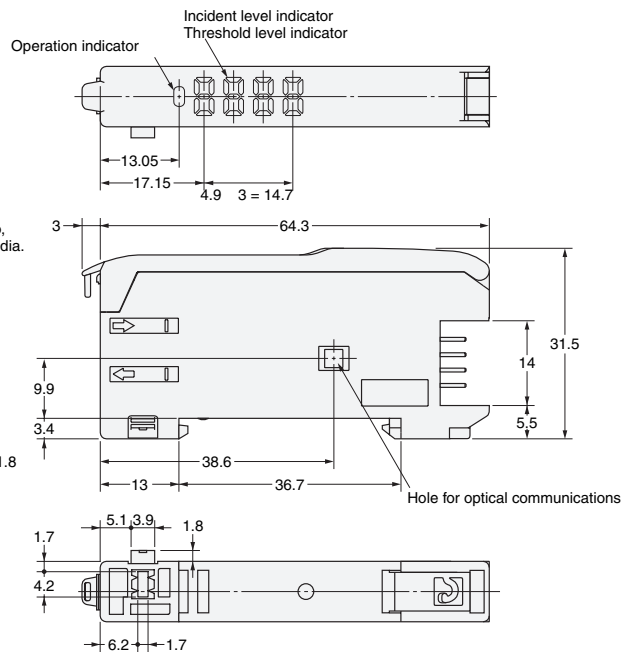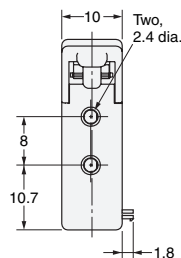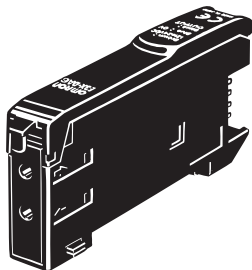
Amplifiers with Standard Connectors

E3X-DA6	E3X-DAG6
E3X-DA7	E3X-DAH6
E3X-DA8	E3X-DAB8
E3X-DA9	E3X-DAG8
E3X-DAB6	E3X-DAH8
E3X-DA6D	E3X-DA6-P

Operation indicator
Incident level indicator
Threshold level indicator

13.05
17.15
4.9 3 = 14.7

10 Two, 2.4 dia.
8
10.7
1.8

3
64.3
9.9
3.4
31.5
14
5.5
13 38.6 36.7

Hole for optical communications

1.7 5.1 3.9 1.8
4.2
6.2 1.7

Dimensions with Master Connector Connected

71
67.5
64.3

E3X-CN11: 4.0 dia.
E3X-CN21: 4.0 dia.
E3X-CN02: With no cable

31.5
1.5
1.8 5.1 3.9
12.95
4
10

Dimensions with Slave Connector Connected

71
67.5
64.3

E3X-CN12: 2.6 dia.
E3X-CN22: 4.0 dia.
E3X-CN02: With no cable

31.5
1.5
1.8 5.1 3.9
3 4.8
12.95
17.45
11.55
4
10
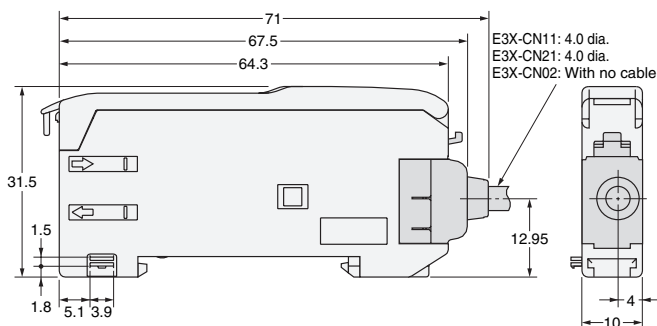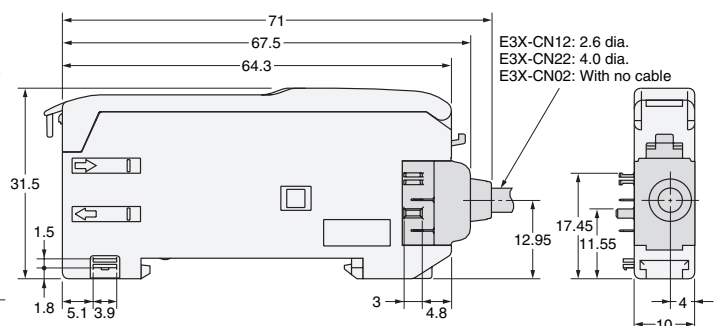
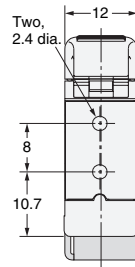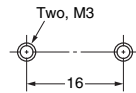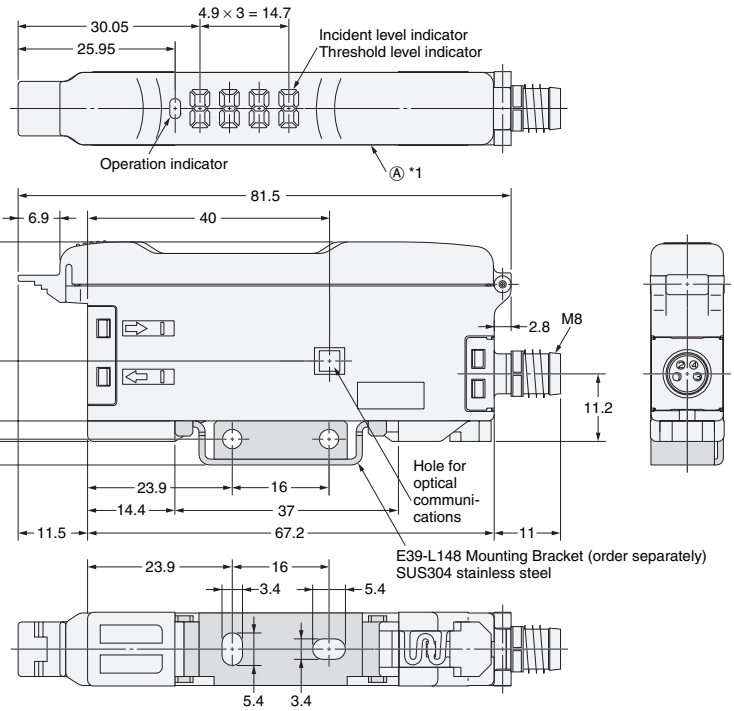## Amplifiers with M8 Connectors, Water-resistant Models
E3X-DA14V
E3X-DA44V
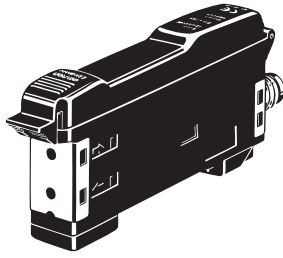
*The Mounting Bracket can also be used on side A.
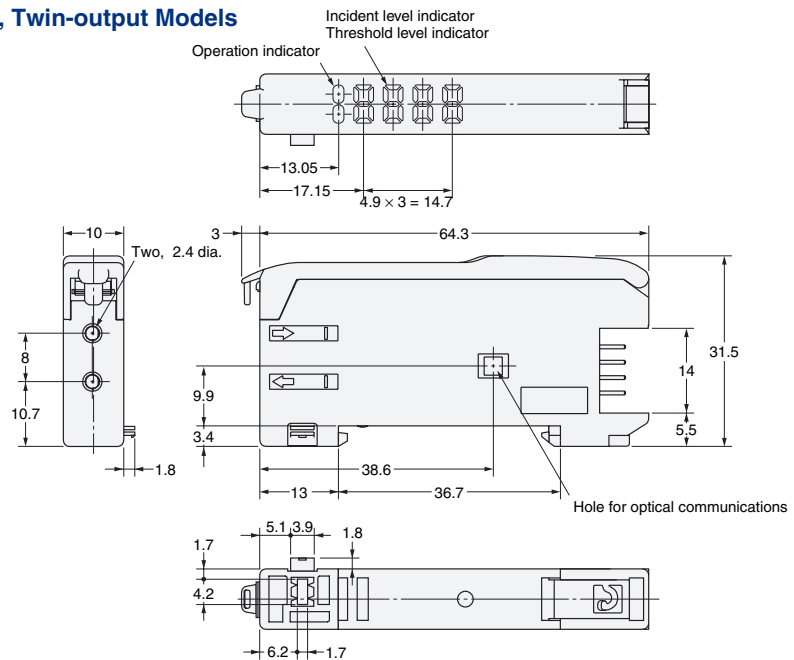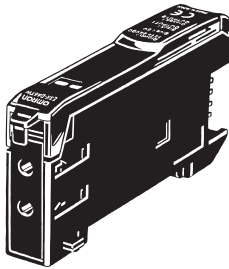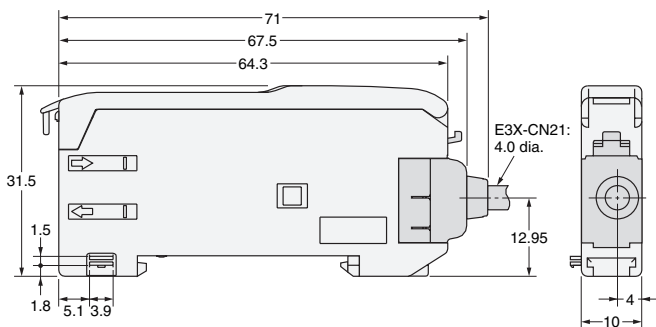
With Mounting Bracket Attached

30.05
25.95
4.9 × 3 = 14.7

Incident level indicator
Threshold level indicator
Operation indicator
Ⓐ *1

81.5
6.9
40
12
33
8
10.7
9.9
3.9 3.4 4.3
23.9
16
14.4
37
11.5
67.2
2.8 M8
11.2
11

Mounting Holes

Two, M3
16

Two, 2.4 dia.

Hole for optical communications

E39-L148 Mounting Bracket (order separately) SUS304 stainless steel

23.9
16
3.4
5.4
5.4 3.4

Amplifiers with Standard Connectors, Twin-output Models
E3X-DA6TW
E3X-DA8TW

Incident level indicator
Threshold level indicator
Operation indicator

13.05
17.15
4.9 × 3 = 14.7

10
Two, 2.4 dia.
8
10.7
1.8

3
64.3
31.5
14
5.5
9.9
3.4
38.6
13
36.7

Hole for optical communications

5.1 3.9 1.8
1.7
4.2
6.2 1.7

Dimensions with Master Connector Connected

71
67.5
64.3
31.5
1.5
1.8
5.1 3.9

E3X-CN21: 4.0 dia.
12.95
4
10

Dimensions with Slave Connector Connected

71
67.5
64.3
31.5
1.5
1.8
5.1 3.9
3
4.8

E3X-CN22: 4.0 dia.
12.95
17.45
11.55
4
10
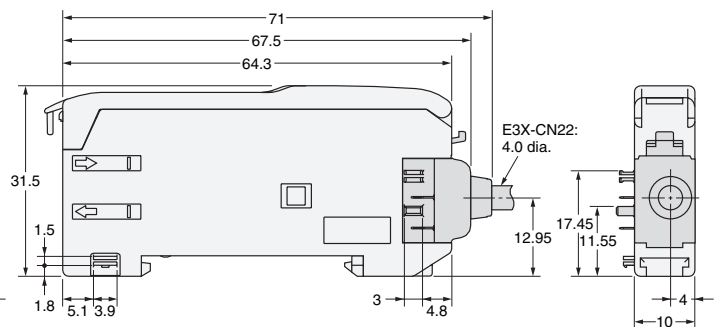
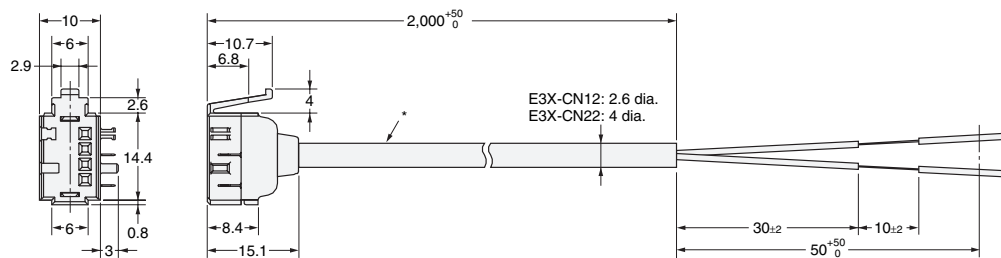## Amplifiers with Connectors

Master Connectors
E3X-CN11
E3X-CN21
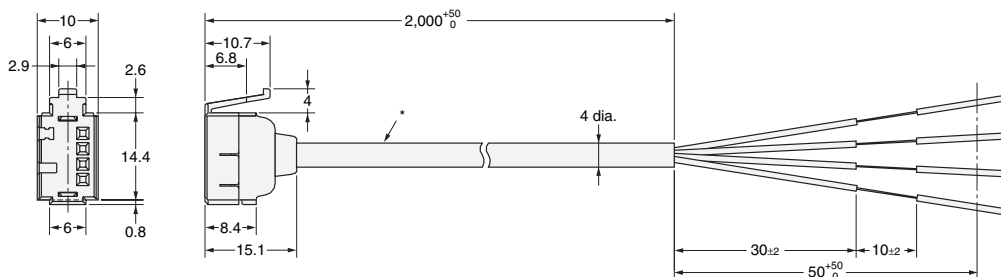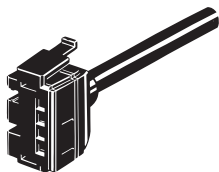
* E3X-CN11: 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm²; Insulation diameter: 1.1 mm).
  E3X-CN21: 4-dia. vinyl-insulated round cable with 4 conductors (Conductor cross section: 0.2 mm²; Insulation diameter: 1.1 mm).

Slave Connectors
E3X-CN12
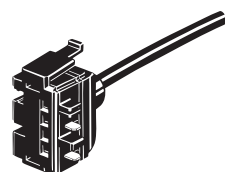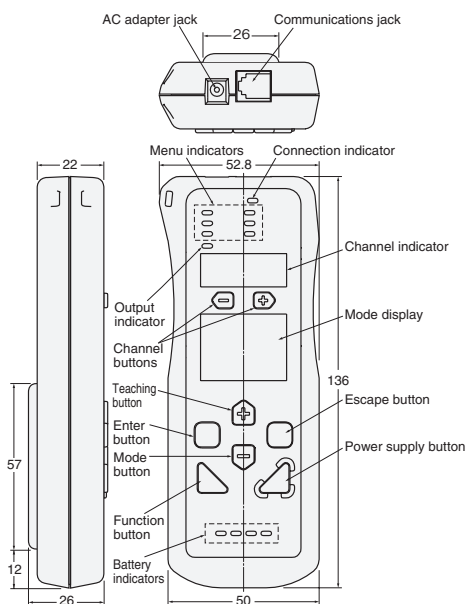**E3X-CN22**

* E3X-CN12: 2.6-dia. vinyl-insulated round cable with 1 conductor (Conductor cross section: 0.2 mm²; Insulation diameter: 1.1 mm).
  E3X-CN22: 4-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.2 mm²; Insulation diameter: 1.1 mm).
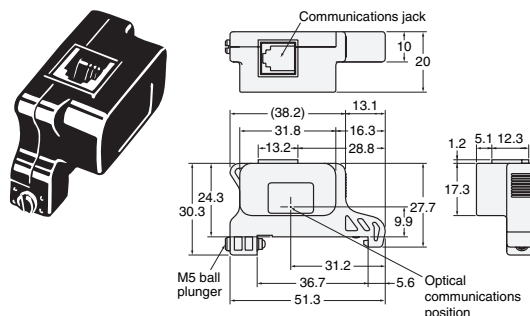
Mobile Console

E3X-MC11

Mobile Console

AC adapter jack   Communications jack

Menu indicators   Connection indicator

Output indicator
Channel buttons
Teaching button
Enter button
Mode button
Function button
Battery indicators

Channel indicator
Mode display
Escape button
Power supply button

Mobile Console Head

Communications jack

M5 ball plunger
Optical communications position

Accessories (Order Separately)
Mounting Brackets
End Plate

In the interest of product improvement, specifications are subject to change without notice.

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2011.5

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