OMRON

# Digital Fiber Sensors
# E3X-DA-S

## The next-generation platform for a wide range of sensing

- The industry's first Power Tuning function in a digital amplifier.
- Large, easy-to-read displays that are clear even from a distance. Seven convenient display formats.
- Stable long-term performance achieved with OMRON's APC function.
- A wide array of advanced functions for even more applications.
- The same ease-of-use as the E3X-DA-N Amplifiers.
- Environmentally friendly design.
- Improved Mobile Console.

# Ordering Information

## ■ Amplifier Units

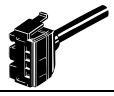
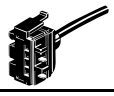
### Amplifier Units with Cables

| Item | | Appearance | Functions | Model | |
|---|---|---|---|---|---|
| | | | | NPN output | PNP output |
| Standard models | |  | --- | E3X-DA11-S | E3X-DA41-S |
| Mark-detecting models | Green LED | | --- | E3X-DAG11-S | E3X-DAG41-S |
| | Blue LED | | --- | E3X-DAB11-S | E3X-DAB41-S |
| Advanced models | Twin-output models | | Area output, self-diagnosis, differential operation | E3X-DA11TW-S | E3X-DA41TW-S |
| | External-input models | | Remote setting, counter, differential operation | E3X-DA11RM-S | E3X-DA41RM-S |

### Amplifier Units with Connectors

| Item | | Appearance | Functions | Model | |
|---|---|---|---|---|---|
| | | | | NPN output | PNP output |
| Standard models | |  | --- | E3X-DA6-S | E3X-DA8-S |
| Mark-detecting models | Green LED | | --- | E3X-DAG6-S | E3X-DAG8-S |
| | Blue LED | | --- | E3X-DAB6-S | E3X-DAB8-S |
| Advanced models | Twin-output models | | Area output, self-diagnosis, differential operation | E3X-DA6TW-S | E3X-DA8TW-S |
| | External-input models | | Remote setting, counter, differential operation | E3X-DA6RM-S | E3X-DA8RM-S |

## ■ Amplifier Unit Connectors (Order Separately)

| Item | 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 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) | |
|---|---|---|---|---|---|
| Model | NPN output | PNP output | | Master Connector | Slave Connector |
| Standard models | E3X-DA6-S | E3X-DA8-S | + | E3X-CN11 (3-wire) | E3X-CN12 (1-wire) |
| Mark-detecting models | E3X-DAG6-S | E3X-DAG8-S | | | |
| | E3X-DAB6-S | E3X-DAB8-S | | | |
| Advanced models | E3X-DA6TW-S | E3X-DA8TW-S | | E3X-CN21 (4-wire) | E3X-CN22 (2-wire) |
| | E3X-DA6RM-S | E3X-DA8RM-S | | | |

### When Using 5 Amplifier Units

| Amplifier Units (5 Units) | + | 1 Master Connector + 4 Slave Connectors |
|---|---|---|

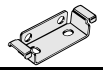
## ■ Mobile Console (Order Separately)

| Appearance | Model | Remarks |
|---|---|---|
|  | E3X-MC11-S<br>(model number of set) | Mobile Console with Head, Cable, and AC adapter provided as accessories |
|  | E3X-MC11-C1-S | Mobile Console |
|  | E3X-MC11-H1 | Head |
|  | E39-Z12-1 | Cable (1.5 m) |

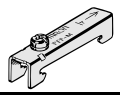
**Note:** Use the E3X-MC11-S Mobile Console for the E3X-DA-S-series Amplifier Units. Other Mobile Consoles cannot be used.

## ■ Accessories (Order Separately)

### Mounting Bracket

| Appearance | Model | Quantity |
|---|---|---|
|  | E39-L143 | 1 |

### End Plate

| Appearance | Model | Quantity |
|---|---|---|
|  | PFP-M | 1 |

# Specifications

## ■ Ratings/Characteristics

### Amplifier Units

#### Amplifier Units with Cables

| Item | Type | | Standard models | Mark-detecting models | | Advanced, twin-output models | Advanced, external-input models |
|---|---|---|---|---|---|---|---|
| | Model | NPN output | E3X-DA11-S | E3X-DAG11-S | E3X-DAB11-S | E3X-DA11TW-S | E3X-DA11RM-S |
| | | PNP output | E3X-DA41-S | E3X-DAG41-S | E3X-DAB41-S | E3X-DA41TW-S | E3X-DA41RM-S |
| Light source (wavelength) | | | Red LED (650 nm) | Green LED (525 nm) | Blue LED (470 nm) | Red LED (650 nm) | |
| Supply voltage | | | 12 to 24 VDC ±10%, ripple (p-p) 10% max. | | | | |
| Power consumption | | | 960 mW max. (current consumption: 40 mA max. at power supply voltage of 24 VDC) | | | 1,080 mW max. (current consumption: 45 mA max. at power supply voltage of 24 VDC) | |
| Control output | | | Load power supply voltage: 26.4 VDC; NPN/PNP open collector; load current: 50 mA max.; residual voltage: 1 V max. | | | | |
| Circuit protection | | | Reverse polarity for power supply connection, output short-circuit | | | | |
| Response time | Super-high-speed mode | NPN | 48 μs for operation and 50 μs for reset | | | 80 μs for operation and reset respectively | 48 μs for operation and 50 μs for reset[*1] |
| | | PNP | 53 μs for operation and 55 μs for reset | | | | 53 μs for operation and 55 μs for reset[*1] |
| | Standard mode | | 1 ms for operation and reset respectively | | | | |
| | High-resolution mode | | 4 ms for operation and reset respectively | | | | |
| Sensitivity setting | | | Teaching or manual method | | | | |
| Functions | Power tuning | | Light emission power and reception gain, digital control method | | | | |
| | Differential detection | | --- | | | Switchable between single edge and double edge detection mode<br>Single edge: Can be set to 250 μs, 500 μs, 1 ms, 10 ms, or 100 ms.<br>Double edge: Can be set to 500 μs, 1 ms, 2 ms, 20 ms, or 200 ms. | |
| | Timer function | | Select from OFF-delay, ON-delay, or one-shot timer.<br>1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 10-ms increments, 200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments) | | | | |
| | Automatic power control (APC) | | High-speed control method for emission current | | | | |
| | Zero-reset | | Display can be reset to zero when required (negative values can be displayed). | | | | |
| | Initial reset | | Settings can be returned to defaults as required. | | | | |
| | Mutual interference prevention | | Possible for up to 10 Units[*2, *3] | | | | |
| | Counter | | --- | | | | Switchable between up counter and down counter.<br>Set count: 0 to 9,999,999 |
| | I/O settings | | --- | | | Output setting (Select from channel 2 output, area output, or self-diagnosis.) | External input setting (Select from teaching, power tuning, zero reset, light OFF, or counter reset.) |
| Display | | | Operation indicator (orange), Power Tuning indicator (orange) | | | Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange) | Operation indicator (orange), Power Tuning indicator (orange) |
| Digital display | | | Select from the following: Incident level + threshold, incident level percentage + threshold, incident light peak level + no incident light bottom level, minimum incident light peak level + maximum no incident light bottom level, long bar display, incident level + peak hold, incident level + channel | | | | Select from same displays as given at the left or a counter display. |
| Display orientation | | | Switching between normal/reversed display is possible. | | | | |

| Item | Type | Standard models | Mark-detecting models | | Advanced, twin-output models | Advanced, external-input models |
|---|---|---|---|---|---|---|
| Model | NPN output | E3X-DA11-S | E3X-DAG11-S | E3X-DAB11-S | E3X-DA11TW-S | E3X-DA11RM-S |
| | PNP output | E3X-DA41-S | E3X-DAG41-S | E3X-DAB41-S | E3X-DA41TW-S | E3X-DA41RM-S |
| Ambient illumination (receiver side) | | Incandescent lamp: 10,000 lux max.<br>Sunlight: 20,000 lux max. | | | | |
| Ambient temperature | | Operating: Groups of 1 to 2 Amplifiers: –25°C to 55°C<br>Groups of 3 to 10 Amplifiers: –25°C to 50°C<br>Groups of 11 to 16 Amplifiers: –25°C to 45°C<br>(with no icing or condensation)<br>Storage: –30°C 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 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 | | | | |
| Enclosure rating | | IEC 60529 IP50 (with Protective Cover attached) | | | | |
| Connection method | | Prewired<br>cable | | | | |
| Weight (packed state) | | Approx. 100 g | | | | |
| Materials | Case | Polybutylene terephthalate (PBT) | | | | |
| | Cover | Polycarbonate (PC) | | | | |
| Accessories | | Instruction sheet | | | | |

***1:** When counter is enabled: 80 μs for operation and reset respectively.

***2:** Communications are disabled if the detection mode is selected during super-high-speed mode, and the communications functions for mutual interference prevention and the Mobile Console will not function.

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

### Amplifier Units with Connectors

(Specifications different to those for Amplifier Units with cables)

| Item | Type | Standard models | Mark-detecting models | | Advanced, twin-output models | Advanced, external-input models |
|---|---|---|---|---|---|---|
| Model | NPN output | E3X-DA6-S | E3X-DAG6-S | E3X-DAB6-S | E3X-DA6TW-S | E3X-DA6RM-S |
| | PNP output | E3X-DA8-S | E3X-DAG8-S | E3X-DAB8-S | E3X-DA8TW-S | E3X-DA8RM-S |
| Connection method | | Standard connector | | | | |
| Weight (packed state) | | Approx. 55 g | | | | |

## Amplifier Unit Connectors

| Item | | 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.)<br>(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<br>(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 | Approx. 25 g |

## Mobile Console

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

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

# Ordering Information: Fiber Units

## ■ Through-beam Fiber Units

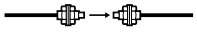
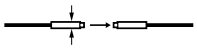
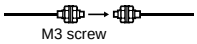
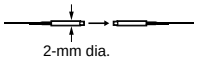
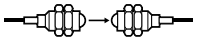
**Note 1.** Free-cut Indicates models that allow free cutting. Models without this mark do not allow free cutting.

**2.** The size of standard sensing object is the same as the fiber core diameter (lens diameter for models with lens).

**3.** The values for the minimum sensing object are representative values that indicate values obtained in standard mode with the sensing distance and sensitivity set to optimum values.

### Long-distance Fiber Units

■ : High-resolution mode ■ : Standard mode ■ : Super-high-speed mode

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| M4 Free-cut |  M4 screw | E3X-DA□-S | 1,700 (4,000)*1<br>1,330 (3,200)<br>350 (840) | 1.4-mm dia. (0.01-mm dia.) | E32-T11L | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 150<br>120<br>75 | | | |
| 3-mm dia. Free-cut |  3-mm dia. | E3X-DA□-S | 1,700<br>1,330<br>350 | | E32-T12L | |
| M3 Free-cut |  M3 screw | E3X-DA□-S | 540<br>440<br>100 | 0.9-mm dia. (0.005-mm dia.) | E32-T21L | 10 mm |
| Free-cut 2-mm dia.; small diameter |  2-mm dia. | E3X-DA□-S | 540<br>440<br>100 | | E32-T22L | |
| Free-cut M14; with lens; ideal for explosion-proof applications |  M14 screw | E3X-DA□-S | 20,000*2<br>20,000*2<br>4,000*2 | 10-mm dia. | E32-T17L | 25 mm |

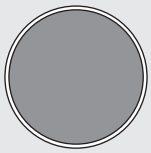
***1:** The optical fiber is 2 m long on each side, so the sensing distance is 4,000 mm.

***2:** The optical fiber for the E32-T17L is 10 m long on each side, so the value is 20,000 mm

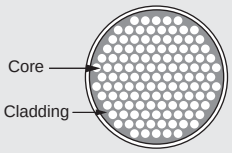
### A Wide Range of Flexible Fibers for Easy Installation without Loss of Light Intensity

**Flexible fiber models are indicated by an "R" at the end of the model number.**
Flexible fiber contains multiple cores.
These cores are all surrounded by cladding, giving a minimum bending radius of 1 mm.

The fiber can be bent at right angles without affecting the light intensity. Handle it just like any other cable.

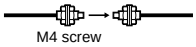
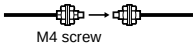
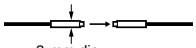
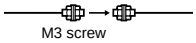
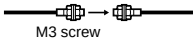


**Conventional Fiber**
Conventional fiber uses just one core and one cladding section. Bending the fiber may break it or reduce the light intensity.



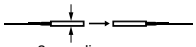
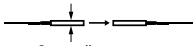
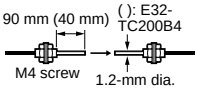
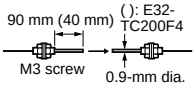

**Flexible Fiber**
Flexible fiber contains multiple independent cores all surrounded by cladding. The fiber can be bent without breaking or reducing the light intensity.

## General-purpose Fiber Units

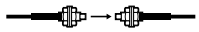
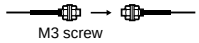
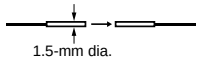
| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| M4 (Free-cut) |  M4 screw | E3X-DA□-S | 1,000 (4,000)*<br>760 (4,000)*<br>200 (1,500) | 1.0-mm dia. (0.005-mm dia.) | E32-TC200 | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 100 (700)<br>75 (550)<br>45 (350) | | | |
| M4 (Free-cut) |  M4 screw | E3X-DA□-S | 700 (4,000)*<br>530 (3,700)<br>140 (970) | | E32-T11R | 1 mm |
| M4 (Free-cut)<br>Fiber sheath material: fluororesin |  M4 screw | E3X-DA□-S | 900 (4,000)*<br>680 (3,600)<br>180 (930) | | E32-T11U<br>*NEW* | 4 mm |
| 3-mm dia. (Free-cut) |  3-mm dia. | E3X-DA□-S | 700<br>530<br>140 | | E32-T12R | 1 mm |
| M3 (Free-cut)<br>Possible to mount the E39-F5 Reflective Side-view Conversion Attachment |  M3 screw | E3X-DA□-S | 900<br>680<br>180 | | E32-TC200A | 25 mm |
| (Free-cut)<br>M3; for detecting minute sensing objects |  M3 screw | E3X-DA□-S | 270<br>220<br>50 | 0.5-mm dia. (0.005-mm dia.) | E32-TC200E | 10 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 25<br>20<br>12 | | | |
| M3 (Free-cut) |  M3 screw | E3X-DA□-S | 160<br>130<br>30 | | E32-T21R | 1 mm |

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

## Fiber Units with Thin Heads

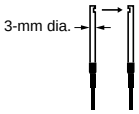
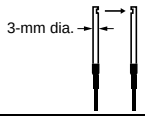
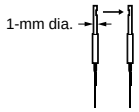
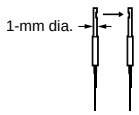
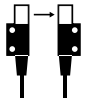
| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| (Free-cut)<br>2-mm dia.; for detecting minute sensing objects |  2-mm dia. | E3X-DA□-S | 270<br>220<br>50 | 0.5-mm dia. (0.005-mm dia.) | E32-T22 | 10 mm |
| (Free-cut)<br>2-mm dia.; for detecting minute sensing objects |  2-mm dia. | E3X-DA□-S | 160<br>130<br>30 | | E32-T22R | 1 mm |
| (Free-cut)<br>1.2-mm dia.; with sleeve |  90 mm (40 mm) ( ): E32-TC200B4<br>M4 screw 1.2-mm dia. | E3X-DA□-S | 1,000<br>760<br>200 | 1.0-mm dia. (0.005-mm dia.) | E32-TC200B<br>E32-TC200B4 | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 100<br>75<br>45 | | | |
| (Free-cut)<br>0.9-mm dia.; with sleeve |  90 mm (40 mm) ( ): E32-TC200F4<br>M3 screw 0.9-mm dia. | E3X-DA□-S | 270<br>220<br>50 | 0.5-mm dia. (0.005-mm dia.) | E32-TC200F<br>E32-TC200F4 | 10 mm |

## Flexible Fiber Units (Resists Breaking) (R4)

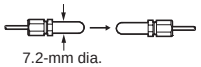
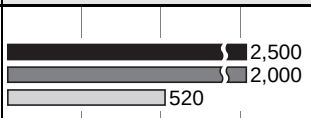
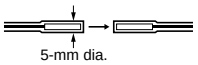
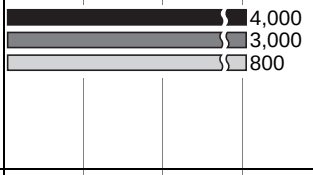
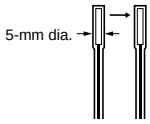
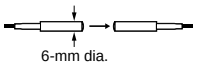
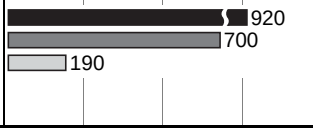
| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Ideal for mounting on moving sections (R4) |  <br>M4 screw | E3X-DA□-S | 900 (4,000)*<br>680 (3,600)<br>180 (930) | 1.0-mm dia. (0.005-mm dia.) | E32-T11 | 4 mm |
| |  <br>M3 screw | E3X-DA□-S | 240<br>200<br>45 | 0.5-mm dia. (0.005-mm dia.) | E32-T21 | |
| |  <br>1.5-mm dia. | E3X-DA□-S | 240<br>200<br>45 | | E32-T22B | |

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

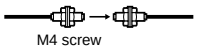
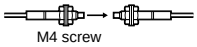
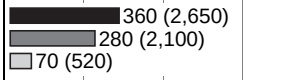
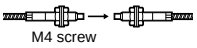
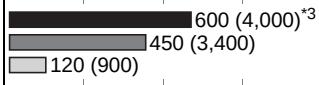
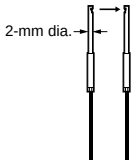
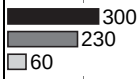
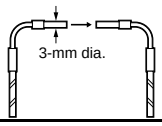
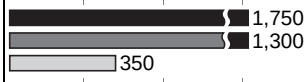
## Side-view Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Long distance; space-saving |  <br>3-mm dia. | E3X-DA□-S | 600<br>460<br>120 | 1.0-mm dia. (0.005-mm dia.) | E32-T14L | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 50<br>40<br>25 | | | |
| Free-cut<br>Space-saving |  <br>3-mm dia. | E3X-DA□-S | 270<br>210<br>50 | | E32-T14LR | 1 mm |
| Free-cut<br>Suitable for detecting minute sensing objects; small diameter |  <br>1-mm dia. | E3X-DA□-S | 160<br>130<br>30 | 0.5-mm dia. (0.005-mm dia.) | E32-T24 | 10 mm |
| Free-cut<br>Suitable for detecting minute sensing objects; small diameter |  <br>1-mm dia. | E3X-DA□-S | 60<br>50<br>10 | | E32-T24R | 1 mm |
| Free-cut<br>Screw-mounting type |  | E3X-DA□-S | 4,500<br>3,400<br>900 | 4-mm dia. (0.1-mm dia.) | E32-T14 | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 320<br>260<br>160 | | | |

## Chemical-resistant Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Fluororesin-covered; round head that resists water drops |  | E3X-DA□-S |  | 4-mm dia. (0.1-mm dia.) | E32-T11F<br>*NEW* | 4 mm |
| Free-cut<br>Fluororesin-covered; withstands chemicals and harsh environments (operating ambient temperature: –30°C to 70°C) |  | E3X-DA□-S |  | 4-mm dia. (0.1-mm dia.) | E32-T12F | 40 mm |
| Free-cut<br>Fluororesin-covered; withstands chemicals and harsh environments; side-view (operating ambient temperature: –30°C to 70°C) |  | E3X-DA□-S |  | 3-mm dia. (0.1-mm dia.) | E32-T14F | |
| Fluororesin; withstands chemicals and harsh environments (operating ambient temperature: –40°C to 200°C) |  | E3X-DA□-S |  | 1.0-mm dia. (0.005-mm dia.) | E32-T81F-S<br>*NEW* | 10 mm |

## Heat-resistant Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Resists 150°C*1; fiber sheath material: fluororesin (operating ambient temperature: –40°C to 150°C) |  | E3X-DA□-S |  | 1.5-mm dia. (0.1-mm dia.) | E32-T51 | 35 mm |
| Resists 200°C; flexible (R10); fiber sheath material: fluororesin (operating ambient temperature: –40°C to 200°C) |  | E3X-DA□-S |  | 1.0-mm dia. (0.005-mm dia.) | E32-T81R-S<br>NEW | 10 mm |
| Resists 350°C*2, with spiral tube; high mechanical strength; fiber sheath material: stainless steel (operating ambient temperature: –60°C to 350°C) |  | E3X-DA□-S |  | | E32-T61-S<br>NEW | 25 mm |
| Free-cut<br>Side-view; resists 150°C*1; suitable for detecting minute sensing objects; fiber sheath material: fluororesin (operating ambient temperature: –40°C to 150°C) |  | E3X-DA□-S |  | | E32-T54 | 35 mm |
| Resists 200°C*2; L-shaped; fiber sheath material: stainless steel |  | E3X-DA□-S |  | 1.7-mm dia. (0.1-mm dia.) | E32-T84S-S<br>NEW | 25 mm |

***1:** For continuous operation, use the products within a temperature range of –40°C to 130°C.

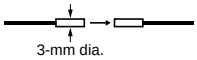
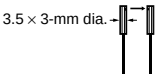
***2:** Indicates the heat-resistant temperature at the fiber tip.

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

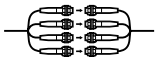
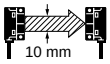
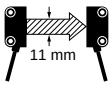
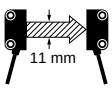
## Fiber Unit with Slot Sensor

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Suitable for film sheet detection; no optical axis adjustment required; easy to mount |  | E3X-DA□-S |  | 4-mm dia. (0.1-mm dia.) | E32-G14 | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S |  | | | |

## Fiber Units with a Narrow Vision Field

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Suitable for detecting wafers |  | E3X-DA□-S | 2,500<br>1,900<br>500 | 1.7-mm dia.<br>(0.1-mm dia.) | E32-T22S | 25 mm |
| Free-cut<br>Side-view; suitable for detecting wafers |  | E3X-DA□-S | 1,750<br>1,300<br>350 | 2-mm dia.<br>(0.1-mm dia.) | E32-T24S | 10 mm |

## Area-sensing Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) (Parentheses: With E39-F1 Lens Unit) | Standard object (min. sensing object) (Parentheses: Opaque object) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Multi-point detection (4-head) |  | E3X-DA□-S | 750<br>610<br>140 | 2-mm dia.<br>(0.1-mm dia.) | E32-M21 | 25 mm |
| Free-cut<br>Detects in a 30-mm area |  | E3X-DA□-S | 2,300<br>1,800<br>450 | (0.3-mm dia.)*1 | E32-T16W | 10 mm |
| |  | E3X-DA□-S | 1,700<br>1,300<br>340 | | E32-T16WR | 1 mm |
| Free-cut<br>Side-view; suitable for applications with limited spatial depth |  | E3X-DA□-S | 1,300<br>1,000<br>260 | (0.2-mm dia.)*1 | E32-T16J | 10 mm |
| |  | E3X-DA□-S | 980<br>750<br>190 | | E32-T16JR | 1 mm |
| Free-cut<br>Suitable for detecting over a 10-mm area; long distance |  | E3X-DA□-S | 3,700<br>2,800<br>740 | (0.6-mm dia.)*2 | E32-T16 | 25 mm |
| Free-cut<br>Stable for detecting minute sensing objects in a wide area |  | E3X-DA□-S | 1,500<br>1,100<br>300 | (0.2-mm dia.)*1 | E32-T16P | 10 mm |
| |  | E3X-DA□-S | 1,100<br>840<br>220 | | E32-T16PR | 1 mm |

***1:** These figures are for a sensing distance of 300 mm. (Figures for the diameter of sensing objects are in the still state.)

***2:** These figures are ones for which detection is possible in each sensing area at a digital incident level of 1,000. (Figures for the diameter of sensing objects are in the still state.)

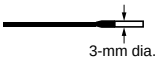
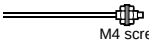
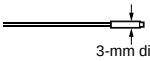
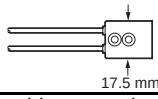
# ■ Fiber Units with Reflective Sensors

**Note 1.** Free-cut Indicates models that allow free cutting. Models without this mark do not allow free cutting.

**2.** The values for the minimum sensing object are representative values that indicate values obtained in standard mode with the sensing distance and sensitivity set to optimum values.

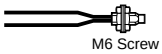
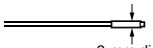
**3.** When set to the maximum sensitivity setting, internal light reflection may cause the sensor to detect incident light. In such case, use adjust the threshold either manually or using teaching.

## Long-distance Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| M6 Free-cut |  M6 screw | E3X-DA□-S | 650<br>400<br>110 | 500×500 (0.005-mm dia.) | E32-D11L | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 44<br>35<br>22 | 100×100 (0.1-mm dia.) | | |
| Free-cut 3-mm dia.; small diameter |  3-mm dia. | E3X-DA□-S | 400<br>230<br>70 | 300×300 (0.005-mm dia.) | E32-D12 | |
| M4 Free-cut |  M4 screw | E3X-DA□-S | 210<br>130<br>35 | 200×200 (0.005-mm dia.) | E32-D21L | 10 mm |
| Free-cut 3-mm dia.; small diameter |  3-mm dia. | E3X-DA□-S | 210<br>130<br>35 | | E32-D22L | |
| Free-cut Square head, super-long distance |  17.5 mm | E3X-DA□-S | 40 to 1,000<br>40 to 700<br>40 to 240 | 300×300 | E32-D16 *NEW* | 4 mm |

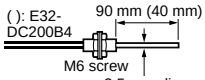
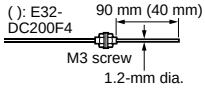
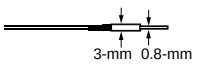
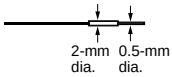
***** Values are sensed for white paper (standard sensing object).

## General-purpose Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| M6 (Free-cut) |  M6 Screw | E3X-DA□-S | 500<br>300<br>90 | 400×400 (0.005-mm dia.) | E32-DC200 | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 32<br>25<br>16 | 100×100 (0.1-mm dia.) | | |
| M6 (Free-cut) |  M6 screw | E3X-DA□-S | 300<br>170<br>50 | 300×300 (0.005-mm dia.) | E32-D11R | 1 mm |
| M6 (Free-cut)<br>Fiber sheath material: fluororesin |  M6 screw | E3X-DA□-S | 300<br>170<br>50 | | E32-D11U NEW | 4 mm |
| 3-mm dia. (Free-cut) |  3-mm dia. | E3X-DA□-S | 300<br>170<br>50 | | E32-D12R | 1 mm |
| M3; small diameter (Free-cut) |  M3 screw | E3X-DA□-S | 130<br>80<br>22 | 100×100 (0.005-mm dia.) | E32-DC200E | 10 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 8<br>6<br>4 | 25×25 (0.2-mm dia.) | | |
| M3; small diameter (Free-cut) |  M3 screw | E3X-DA□-S | 50<br>30<br>8 | 50×50 (0.005-mm dia.) | E32-D21R | 1 mm |
| 3-mm dia.; small diameter (Free-cut) |  3-mm dia. | E3X-DA□-S | 50<br>30<br>8 | | E32-D22R | |

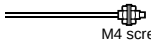
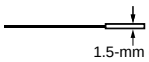
***** Values are sensed for white paper (standard sensing object).

## Fiber Units with Thin Heads

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| 2.5-mm dia.; with sleeve (Free-cut) |  ( ): E32-DC200B4 90 mm (40 mm) M6 screw 2.5-mm dia. | E3X-DA□-S | 500<br>300<br>90 | 400×400 (0.005-mm dia.) | E32-DC200B<br>E32-DC200B4 | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 32<br>25<br>16 | 100×100 (0.1-mm dia.) | | |
| 1.2-mm dia.; with sleeve (Free-cut) |  ( ): E32-DC200F4 90 mm (40 mm) M3 screw 1.2-mm dia. | E3X-DA□-S | 130<br>80<br>22 | 100×100 (0.005-mm dia.) | E32-DC200F<br>E32-DC200F4 | 10 mm |
| 0.8-mm dia.; for detecting minute sensing objects (Free-cut) |  3-mm dia. 0.8-mm dia. | E3X-DA□-S | 25<br>16<br>4 | 25×25 (0.005-mm dia.) | E32-D33 | 4 mm |
| 0.5-mm dia.; for detecting very minute sensing objects |  2-mm dia. 0.5-mm dia. | E3X-DA□-S | 5<br>3<br>0.8 | | E32-D331 | |

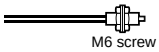
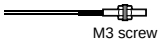
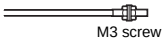
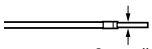
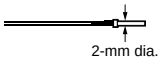
***** Values are sensed for white paper (standard sensing object).

## Flexible Fiber Units (Resists Breaking) (R4)

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Ideal for mounting on moving sections (R4) Free-cut |  M6 screw | E3X-DA□-S | 300<br>170<br>50 | 300×300 (0.005-mm dia.) | E32-D11 | 4 mm |
| Free-cut |  M3 screw | E3X-DA□-S | 50<br>30<br>8 | 50×50 (0.005-mm dia.) | E32-D21 | |
| Free-cut |  M4 screw | E3X-DA□-S | 110<br>70<br>20 | 100×100 (0.005-mm dia.) | E32-D21B | |
| |  1.5-mm dia. | E3X-DA□-S | 50<br>30<br>8 | 50×50 (0.005-mm dia.) | E32-D22B | |

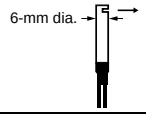
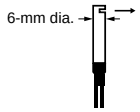
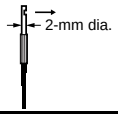
***** Values are sensed for white paper (standard sensing object).

## Coaxial Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut M6 coaxial; high-precision positioning |  M6 screw | E3X-DA□-S | 500<br>300<br>90 | 500×500 (0.005-mm dia.) | E32-CC200 | 25 mm |
| | | E3X-DAG□-S<br>E3X-DAB□-S | 32<br>25<br>16 | 100×100 (0.1-mm dia.) | | |
| Free-cut 3-mm dia.; small diameter; coaxial; high-precision positioning |  3-mm dia. | E3X-DA□-S | 250<br>150<br>45 | 300×300 (0.005-mm dia.) | E32-D32L | |
| Free-cut M3 coaxial; high-precision positioning |  M3 screw | E3X-DA□-S | 120<br>75<br>22<br>Spot diameter<br>• 0.5-mm dia.<br>• 4.0-mm dia. max. | 100×100 (0.005-mm dia.) | E32-C31 | |
| M3 coaxial; high-precision positioning |  M3 screw | E3X-DA□-S | 50<br>35<br>8<br>Spot diameter<br>• 0.1-mm dia.<br>• 0.2-mm dia.<br>• 4.0-mm dia. max. | 50×50 (0.005-mm dia.) | E32-C41 | |
| 2-mm dia. coaxial; high-precision positioning |  2-mm dia. | E3X-DA□-S | 50<br>35<br>8<br>Spot diameter<br>• Adjustable in the range 0.1 to 0.6-mm dia. | | E32-C42 | |
| Free-cut 2-mm dia. coaxial; high-precision positioning |  2-mm dia. | E3X-DA□-S | 120<br>75<br>22<br>Spot diameter<br>• Adjustable in the range 0.5 to 1-mm dia. | 100×100 (0.005-mm dia.) | E32-D32 | |

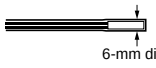
***** Values are sensed for white paper (standard sensing object).

## Side-view Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>6-mm dia.; long distance |  | E3X-DA□-S | 200<br>110<br>36 | 200×200<br>(0.005-mm dia.) | E32-D14L | 25 mm |
| 6-mm dia. Free-cut |  | E3X-DA□-S | 80<br>45<br>14 | 100×100<br>(0.005-mm dia.) | E32-D14LR | 1 mm |
| Free-cut<br>2-mm dia.; small diameter; space-saving |  | E3X-DA□-S | 50<br>30<br>8 | 50×50<br>(0.005-mm dia.) | E32-D24 | 10 mm |
| |  | E3X-DA□-S | 26<br>15<br>4 | | E32-D24R | 1 mm |

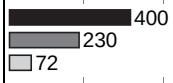
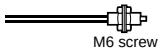
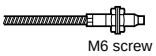
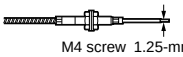
***** Values are sensed for white paper (standard sensing object).

## Chemical-resistant Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Fluororesin-covered; withstands chemicals and harsh environments (operating ambient temperature:<br>–30°C to 70°C |  | E3X-DA□-S | 160<br>95<br>30 | 200×200<br>(0.005-mm dia.) | E32-D12F | 40 mm |

***** Values are sensed for white paper (standard sensing object).

## Heat-resistant Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)*1 | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Resists 150°C*2; fiber sheath material: fluororesin (operating ambient temperature: −40°C to 150°C) |  <br>M6 screw | E3X-DA□-S |  <br>400<br>230<br>72 | 200×200 (0.005-mm dia.) | E32-D51 | 35 mm |
| Resists 200°C*3; fiber sheath material: fluororesin (operating ambient temperature: −40°C to 200°C) |  <br>M6 screw | E3X-DA□-S |  <br>150<br>90<br>27 | | E32-D81R-S<br>NEW | 10 mm |
| Resists 350°C*3; fiber sheath material: stainless steel (operating ambient temperature: −60°C to 350°C) |  <br>M6 screw | E3X-DA□-S |  <br>150<br>90<br>27 | | E32-D61-S<br>NEW | 25 mm |
| Resists 400°C*3; fiber sheath material: stainless steel (operating ambient temperature: −40°C to 400°C) |  <br>M4 screw 1.25-mm dia. | E3X-DA□-S |  <br>100<br>60<br>18 | 100×100 (0.005-mm dia.) | E32-D73-S<br>NEW | |

***1:** Values are sensed for white paper (standard sensing object).

***2:** For continuous operation, use the products within a temperature range of −40°C to 130°C.

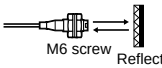
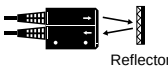
***3:** Indicates the heat-resistant temperature at the fiber tip.

## Area-sensing Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Side-view; detection over wide areas |  | E3X-DA□-S |  <br>250<br>150<br>45 | 300×300 (0.005-mm dia.) | E32-D36P1 | 25 mm |

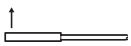
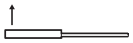
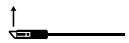
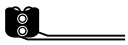
***** Values are sensed for white paper (standard sensing object).

## Retroreflective Fiber Units

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Transparent object detection |  <br>M6 screw Reflector E39-R3 | E3X-DA□-S |  <br>10 to 250<br>10 to 250<br>10 to 250 | 35-mm dia. (0.1-mm dia.) | E32-R21<br>+<br>E39-R3<br>(Attachment) | 10 mm |
| Free-cut<br>Transparent object detection (operating ambient temperature: −25°C to 55°C); degree of protection: IEC60529 IP66 |  <br>Reflector E39-R1 | E3X-DA□-S |  <br>150 to 1,500<br>150 to 1,500<br>150 to 1,500 | 35-mm dia. (0.2-mm dia.) | E32-R16<br>+<br>E39-R1<br>(Attachment) | 25 mm |

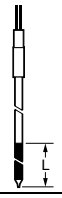
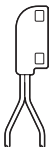
***** Values are sensed for white paper (standard sensing object).

## Limited-reflective Fiber Units

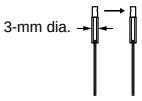
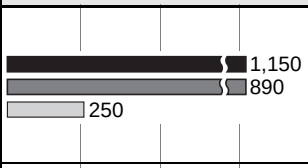
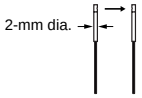
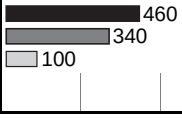
| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm)* | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Suitable for positioning liquid crystal glass |  | E3X-DA□-S | 0 to 15<br>0 to 15<br>0 to 15 | 100×100<br>Soda glass with reflection factor of 7% | E32-L16<br>*NEW* | 25 mm |
| Free-cut<br>Suitable for positioning liquid crystal glass |  | E3X-DA□-S | 4 to 12<br>4 to 12<br>4 to 12 | | E32-L56E1<br>E32-L56E2 | 35 mm |
| Suitable for positioning liquid crystal glass (Resists 300°C) |  | E3X-DA□-S | 5 to 18<br>5 to 18<br>5 to 18 | | E32-L66<br>*NEW* | 25 mm |
| Free-cut<br>Liquid crystal glass, mounting detection, small |  | E3X-DA□-S | 0 to 4<br>0 to 4<br>0 to 4 | 25×25<br>(0.005-mm dia.) | E32-L24S<br>*NEW* | 10 mm |
| Free-cut<br>Detects wafers and small differences in height; (operating ambient temperature: –40°C to 105°C); degree of protection: IEC60529 IP50 |  | E3X-DA□-S | 4±2<br>4±2<br>4±2 | | E32-L24L | 10 mm |
| |  | E3X-DA□-S | 7.2±1.8<br>7.2±1.8<br>7.2±1.8 | | E32-L25L | |
| Free-cut<br>Detects wafers and small differences in height; degree of protection: IEC60529 IP50 |  | E3X-DA□-S | 3.3<br>3.3<br>3.3 | | E32-L25 | 25 mm |
| |  | E3X-DA□-S | 3.3<br>3.3<br>3.3 | | E32-L25A | |

***** Values are sensed for white paper (standard sensing object).

## Fluid-level Detection Fiber Units

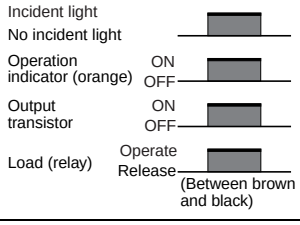
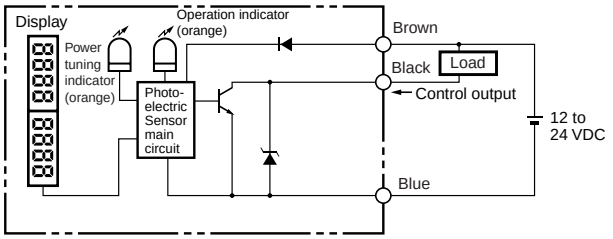
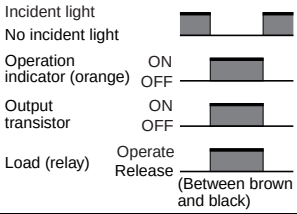
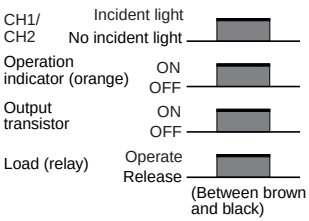
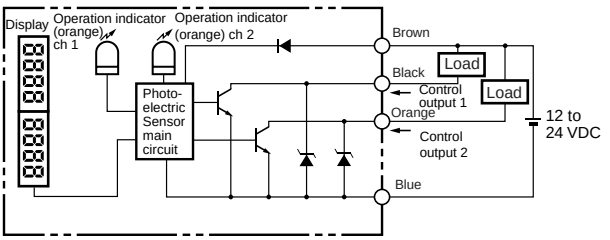
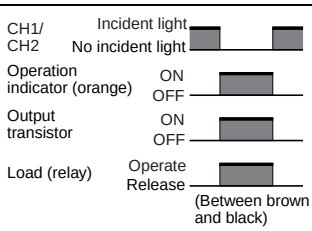
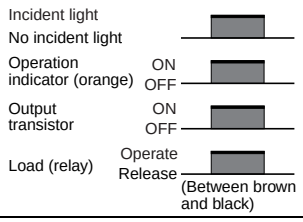
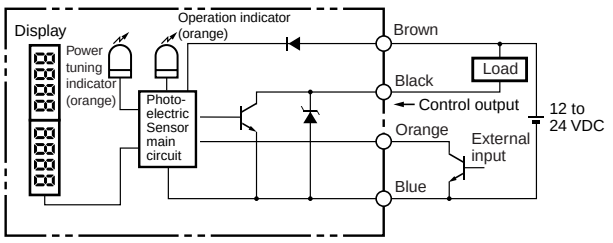
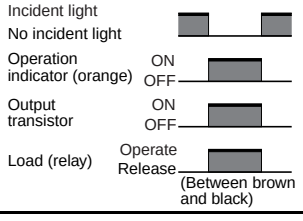
| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Fluid contact type: unbendable section L 150 mm, 350 mm (two types); (operating ambient temperature: –40°C to 200°C) |  | E3X-DA□-S | --- | Pure water at 25°C | E32-D82F1<br>E32-D82F2 | 40 mm |
| Free-cut<br>Tube-mounting type; Light ON when fluid is present; minimal influence from bubbles and water drops |  | E3X-DA□-S | Applicable tube: Transparent tube<br>Tube diameter: 3.2, 6.4, or 9.5 mm<br>(Tube must be FEP or material with equivalent transparency; recommended wall thickness: 1 mm) | | E32-A01 | 4 mm |
| Free-cut<br>Tube-mounting type; light ON when fluid is present; minimal influence from bubbles and water drops |  | E3X-DA□-S | Applicable tube: Transparent tube<br>Tube diameter: 6 to 13 mm<br>(Tube must be FEP or material with equivalent transparency; recommended wall thickness: 1 mm) | | E32-A02 | |
| Free-cut<br>Tube-mounting type; dense mounting to detect level differences of 4 mm |  | E3X-DA□-S | Applicable tube: Transparent tube<br>Tube diameter: 8 to 10 mm<br>(Tube must be FEP or material with equivalent transparency; recommended wall thickness: 1 mm) | | E32-L25T | 10 mm |
| Free-cut<br>Tube-mounting type; unlimited tube diameter; minimal influence from bubbles and water drops |  | E3X-DA□-S | Applicable tube: Transparent tube<br>Tube diameter: No restriction<br>(Tube must be FEP or material with equivalent transparency) | | E32-D36F | 4 mm |

## Mapping Sensors (Through-beam)

| Features | Appearance | Applicable Amplifier Unit | Sensing distance (mm) | Standard object (min. sensing object: Gold wire) | Model | Permissible bending radius |
|---|---|---|---|---|---|---|
| Free-cut<br>Super-narrow vision field; side-view; opening angle: 1.5°; simple adjustment |  | E3X-DA□-S |  | 2-mm dia. (0.1-mm dia.) | E32-A03 | 1 mm |
| Free-cut<br>Super-narrow vision field; small; side-view; opening angle: 3°; simple adjustment |  | E3X-DA□-S |  | 1.2-mm dia. (0.1-mm dia.) | E32-A04 | 10 mm |

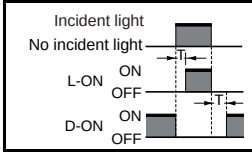
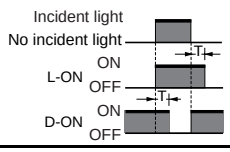
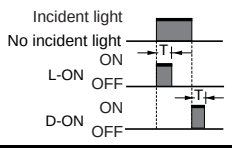
# Output Circuits

## NPN Output

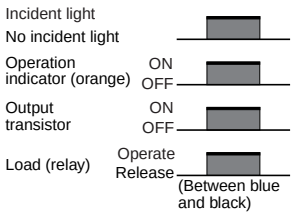
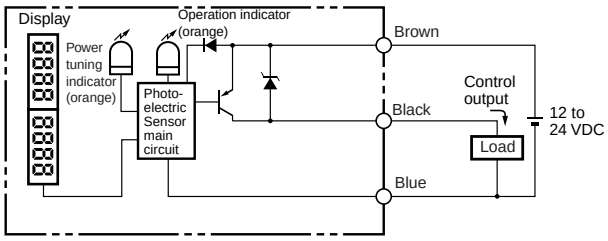
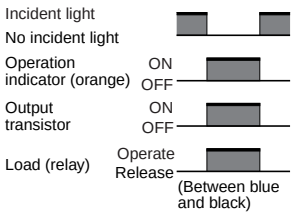
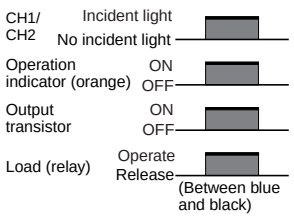
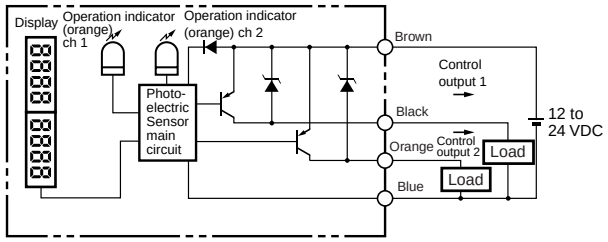
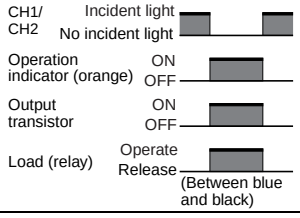
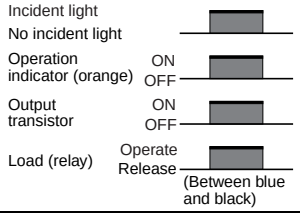
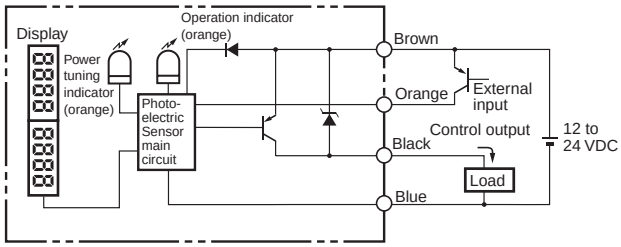
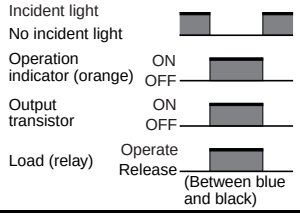
| Model | Mode selector | Timing chart | Mode selector | Output circuit |
|---|---|---|---|---|
| E3X-DA11-S<br>E3X-DA6-S<br>E3X-DAG11-S<br>E3X-DAG6-S<br>E3X-DAB11-S<br>E3X-DAB6-S | LIGHT ON (L/ON) |  | Light ON |  |
| | DARK ON (D/ON) |  | Dark ON | |
| E3X-DA11TW-S<br>E3X-DA6TW-S | LIGHT ON (L/ON) |  | Light ON |  |
| | DARK ON (D/ON) |  | Dark ON | |
| E3X-DA11RM-S<br>E3X-DA6RM-S | LIGHT ON (L/ON) |  | Light ON |  |
| | DARK ON (D/ON) |  | Dark ON | |

**Note 1.** The ON/OFF regions when areas settings are used with the E3X-DA□TW-S are 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.** Time Charts for Timer Settings (T: Set Time)

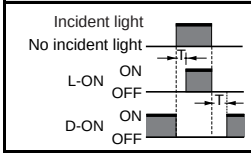
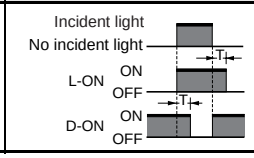
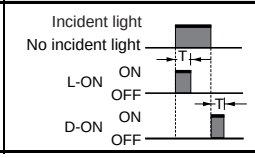
| ON delay | OFF delay | One-shot |
|---|---|---|
|  |  |  |

## PNP Output

| Model | Mode selector | Timing chart | State of output transistor | Output circuit |
|---|---|---|---|---|
| E3X-DA41-S<br>E3X-DA8-S<br>E3X-DAG41-S<br>E3X-DAG8-S<br>E3X-DAB41-S<br>E3X-DAB8-S | LIGHT ON (L/ON) |  | Light ON |  |
| | DARK ON (D/ON) |  | Dark ON | |
| E3X-DA41TW-S<br>E3X-DA8TW-S | LIGHT ON (L/ON) |  | Light ON |  |
| | DARK ON (D/ON) |  | Dark ON | |
| E3X-DA41RM-S<br>E3X-DA8RM-S | LIGHT ON (L/ON) |  | Light ON |  |
| | DARK ON (D/ON) |  | Dark ON | |

**Note 1.** The ON/OFF regions when areas settings are used with the E3X-DA□TW-S are 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.

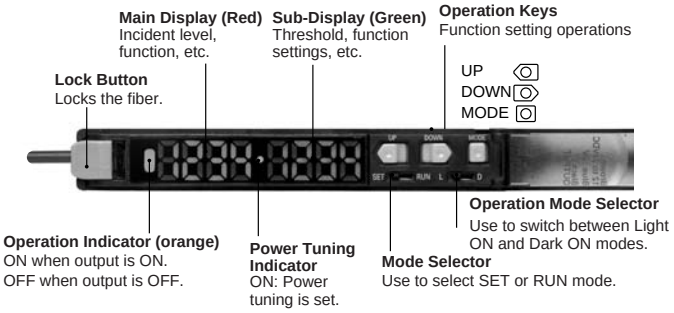
**2.** Time Charts for Timer Settings (T: Set Time)

| ON delay | OFF delay | One-shot |
|---|---|---|
|  |  |  |

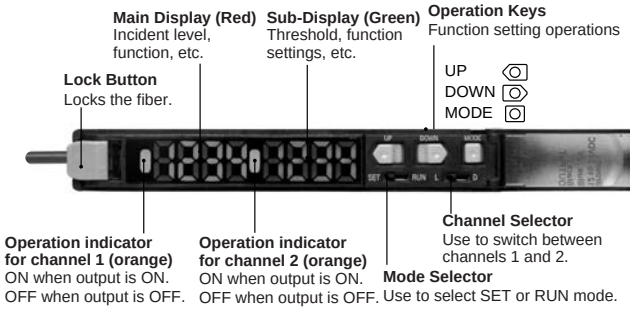
# Nomenclature

## ■ Amplifier Units

**E3X-DA□-S**
**E3X-DA□RM-S**




**E3X-DA□TW-S**




# Adjustment Methods

## 1. Setting the Operation Mode

The operation mode is set with the Mode Selector.

| Operation mode | | Operation |
|---|---|---|
| Light ON | L·ON | L (Factory-set) |
| Dark ON | D·ON | D |

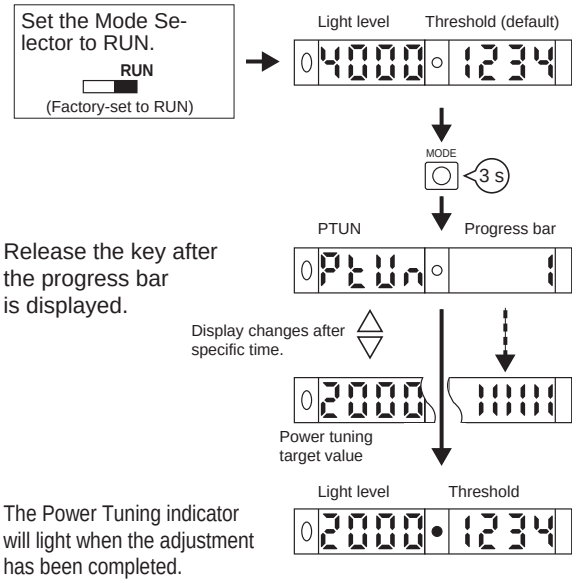
***** E3X-DA□TW-S: The operation mode is set in SET mode. Refer to *5. Setting Functions in SET Mode* on page 22.

***** E3X-DA□TW-S: Set the Channel Selector to the desired channel before making any adjustments or settings. This is true for all adjustments and settings.

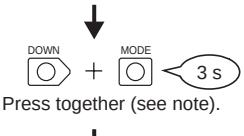
## 2. Adjusting the Power (RUN Mode)

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

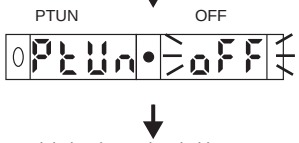
***** Confirm that the MODE key setting is PTUN (power tuning). The default setting is PTUN. Refer to *5. Setting Functions in SET Mode* on page 22.




To restore the default power settings:




Press together (see note).




"OFF" will flash twice.


The Power Tuning indicator will go out when the default setting has been restored.

*** Setting Errors**

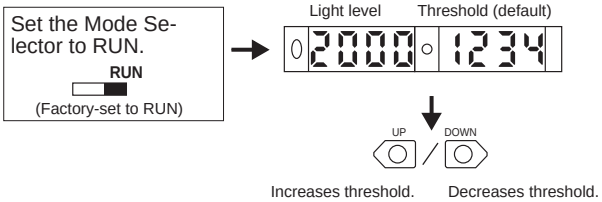
An error has occurred if one of the following displays appears after the progress bar is displayed.

| Display | Error | Action |
|---|---|---|
| Flashes twice<br>PtUn oUEr<br>PTUN OVER | **Over Error**<br>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<br>PtUn bOtA<br>PTUN BOTM | **Bottom Error**<br>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 1/25th the incident light value. |

**Note:** Press the DOWN key right after pressing the MODE key.

## 3. Setting Thresholds Manually (RUN Mode)

A threshold can be set manually. A threshold value can also be fine-tuned using manual setting after teaching.



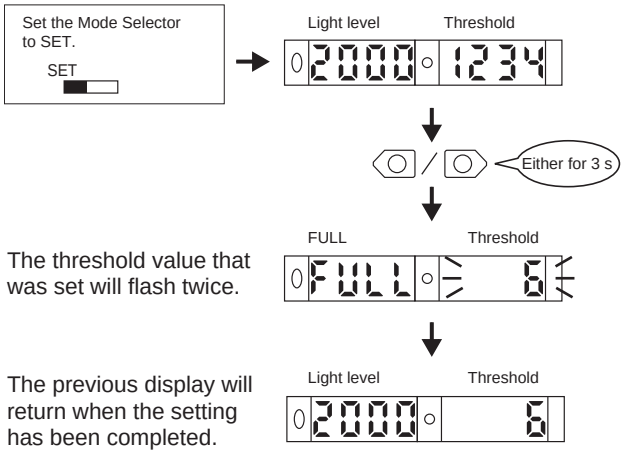

***** Even if the display method for display switching is changed, the threshold will appear on the sub-display when the key is pressed.

# 4. Teaching the Threshold Value (SET Mode)

* There are four methods that can be used for teaching, as described below. Use the method most suitable for the application.
* An error has occurred if OVER, LO, or NEAR is displayed on the sub-display. Repeat the operation from the beginning.

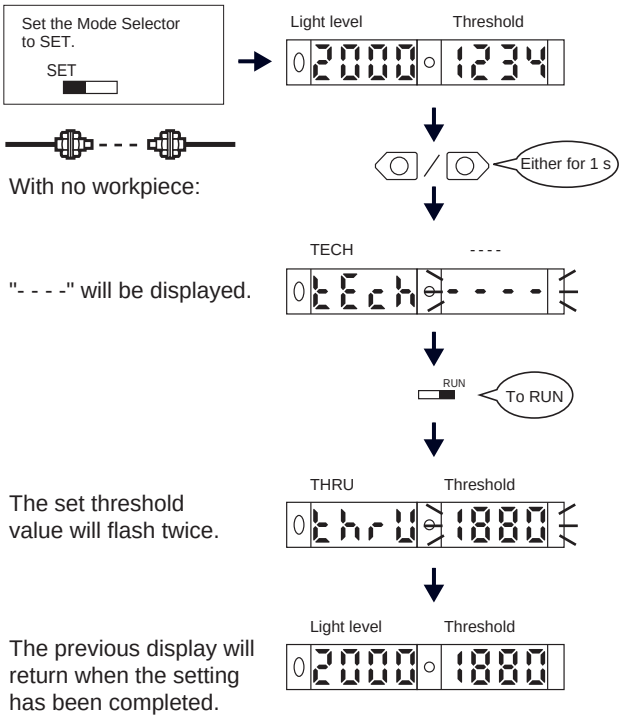
## 4-1. Setting the Threshold at Maximum Sensitivity

The threshold can be set at the maximum sensitivity. This method is ideal when using a Through-beam Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



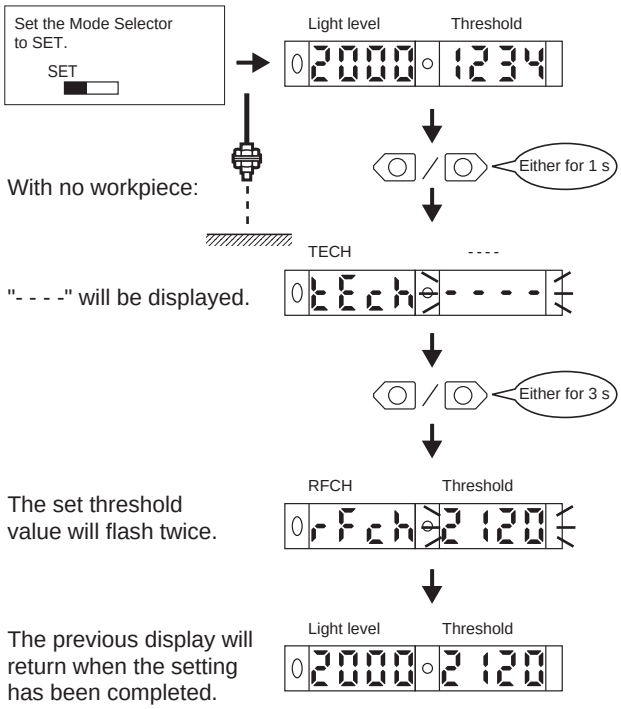

## 4-2. Teaching a Through-beam Fiber Unit without a Workpiece

A value about 6% less than the incident light level can be set as the threshold value. This method is ideal when detecting very small differences in light level, such as when detecting very fine workpieces or transparent workpieces like transparent fibers.



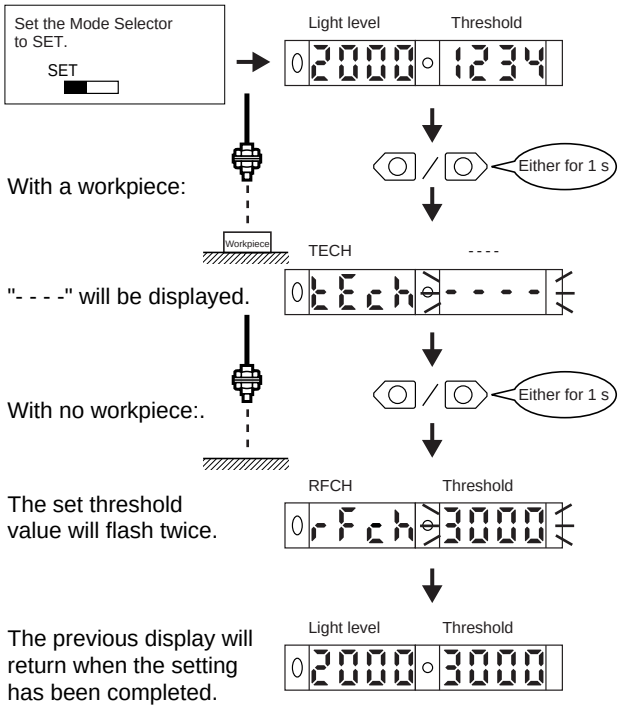

## 4-3. Teaching a Reflective Fiber Unit without a Workpiece

A value about 6% greater than the incident light level can be set as the threshold value. This method is ideal when using a Reflective Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.




## 4-4. Teaching With and Without a Workpiece

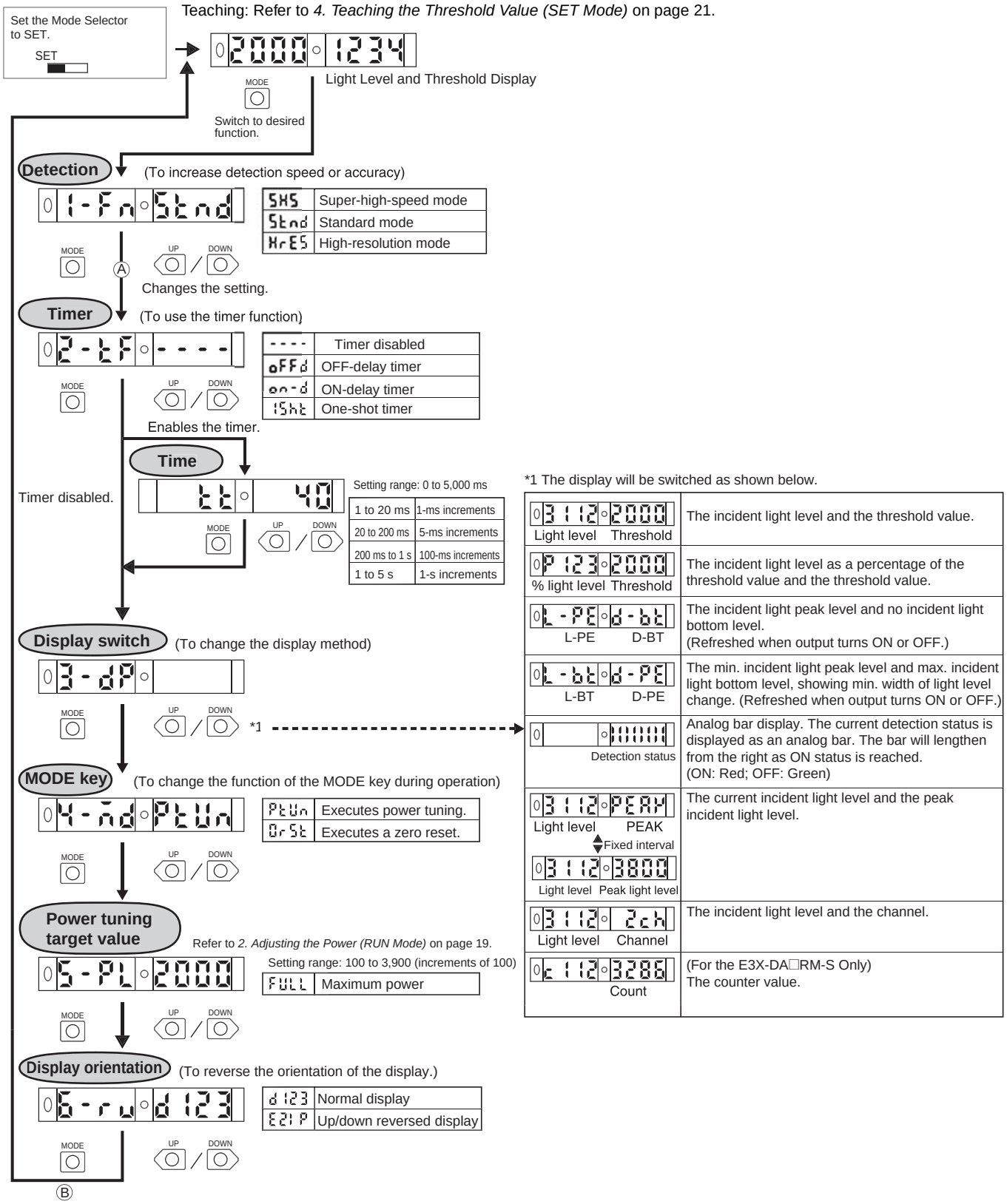
Teaching can be performed twice, once with and once without a workpiece, and the value between the two measured value can be set as the threshold.



# 5. Setting Functions in SET Mode

***** The default settings are shown in the transition boxes between functions.

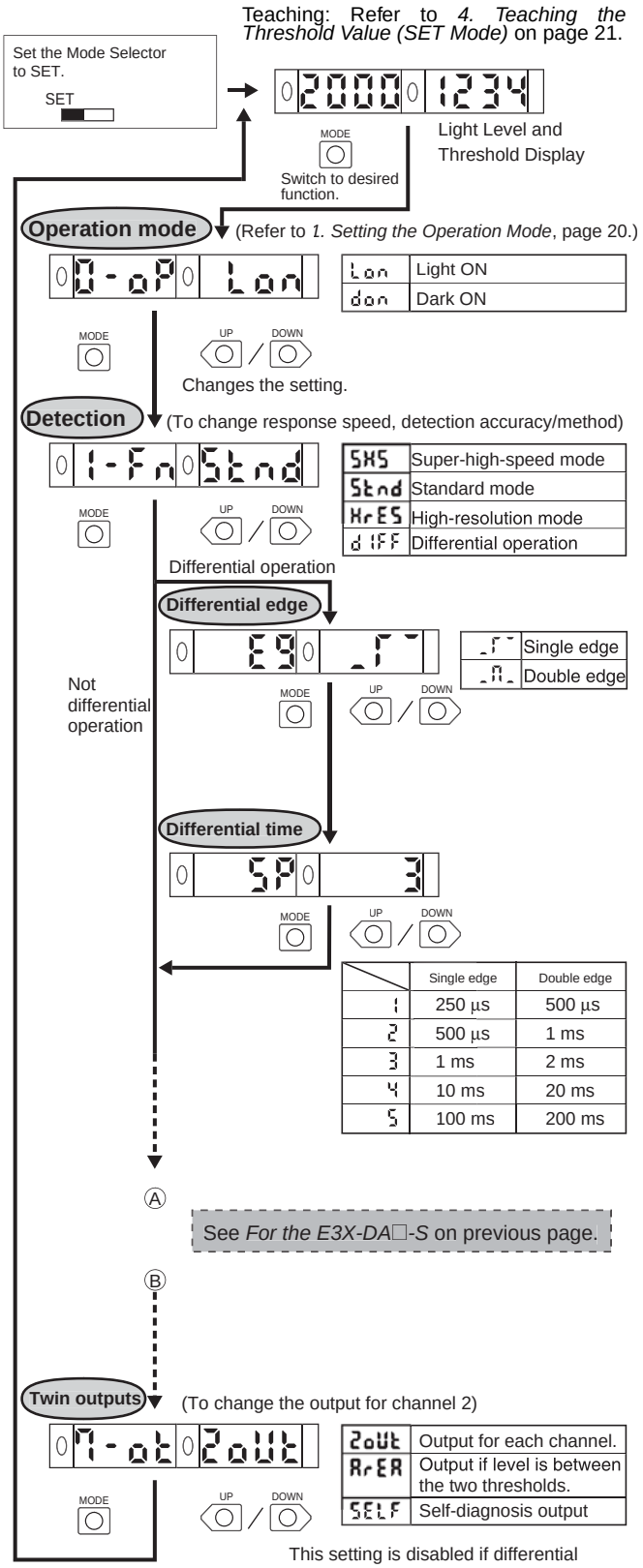
## For the E3X-DA□-S



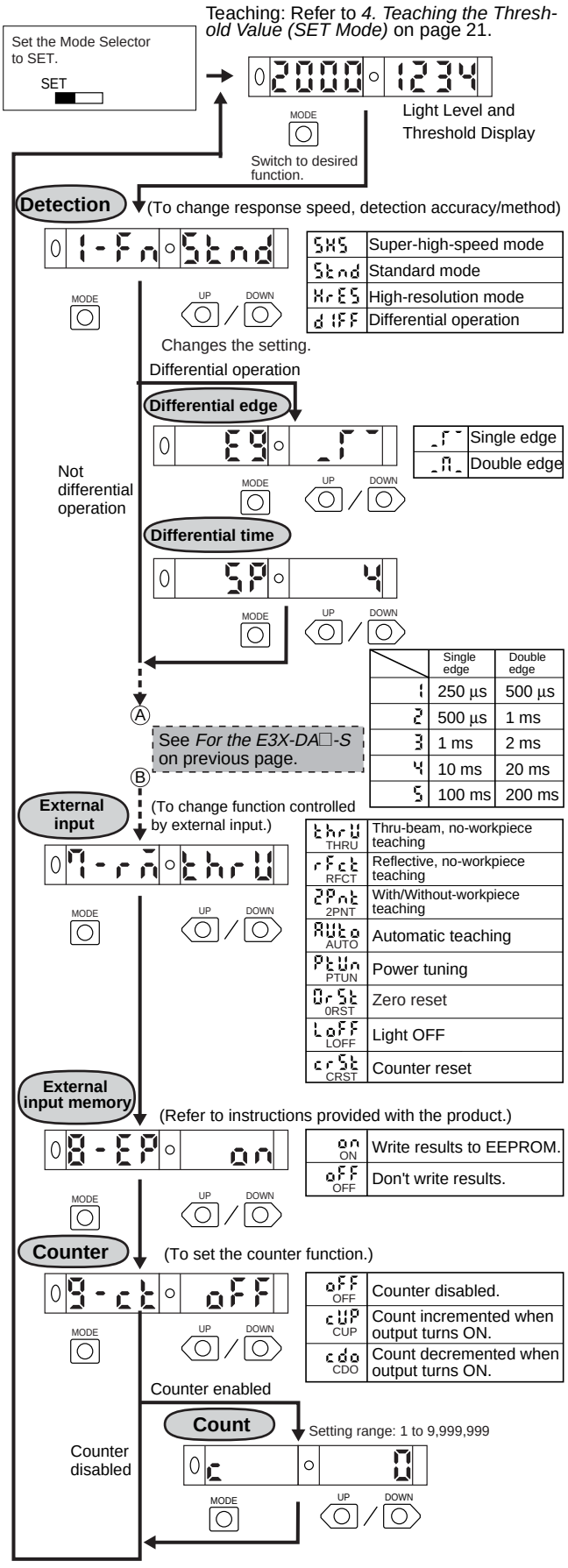

*1 The display will be switched as shown below.

| | |
|---|---|
| 3112 2000 (Light level / Threshold) | The incident light level and the threshold value. |
| P123 2000 (% light level / Threshold) | The incident light level as a percentage of the threshold value and the threshold value. |
| L-PE d-bt (L-PE / D-BT) | The incident light peak level and no incident light bottom level. (Refreshed when output turns ON or OFF.) |
| L-bt d-PE (L-BT / D-PE) | The min. incident light peak level and max. incident light bottom level, showing min. width of light level change. (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) |
| 3112 PEAK (Light level / PEAK) ↕ Fixed interval 3112 3800 (Light level / Peak light level) | The current incident light level and the peak incident light level. |
| 3112 2ch (Light level / Channel) | The incident light level and the channel. |
| t112 3286 (Count) | (For the E3X-DA□RM-S Only) The counter value. |

## For the E3X-DA□TW-S




## For the E3X-DA□RM-S

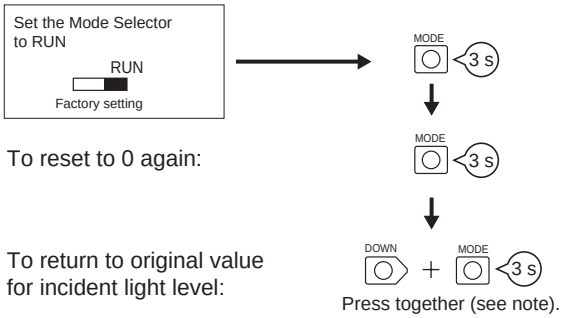


# 6. Convenient Functions

## 6-1. Zeroing the Digital Display

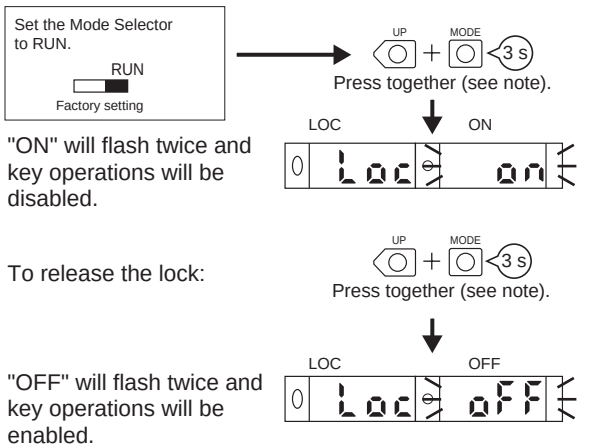
The incident light level on the digital display can be set to 0.

* Change the function to 0RST (zero reset) with the MODE key. The default setting is PTUN. Refer to *5. Setting Functions in SET Mode* on page 22.




## 6-2. Locking the Keys

All key operations can be disabled.

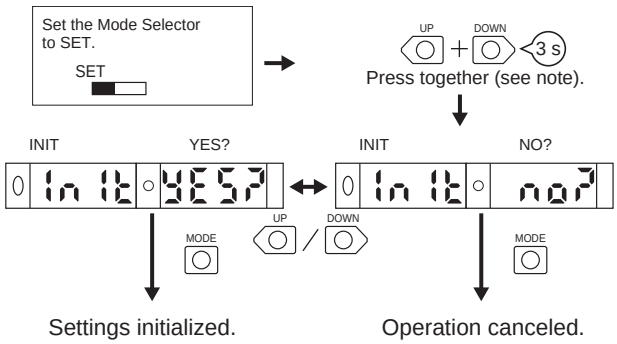



* If a key is pressed while key operations are locked, "LOC" will flash twice on the display to indicate that key operations have been disabled.

**Note:** Press the DOWN key right after pressing the MODE key.

## 6-3. Initializing Settings

All settings can be returned to their original default settings.



# Safety Precautions

**Note:** In addition to the following precautions, please read and observe the common precautions for the instructions included with the product.

## ■ Precautions for Correct Use

### Amplifier Unit

### Installation

#### ● Operation after Turning Power ON

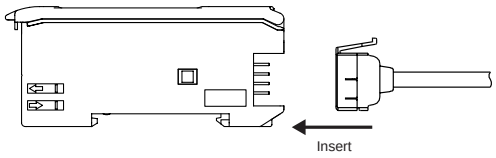
The Amplifier Unit is ready to operate within 200 ms after the power supply is turned ON. If the Sensor and load are connected to power supplies separately, be sure to turn ON the power supply to the Sensor first.

### Mounting

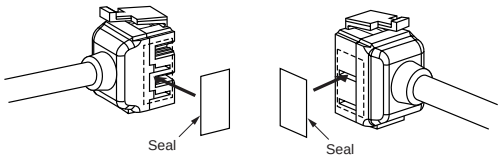
#### ● Connecting and Disconnecting Connectors

**Mounting Connectors**

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



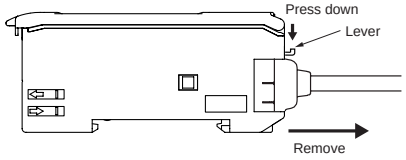

2. Attach the protector seals (provided as accessories) to the sides of master and slave connectors that are not connected.




**Note:** Attach the seals to the sides with grooves

**Removing Connectors**

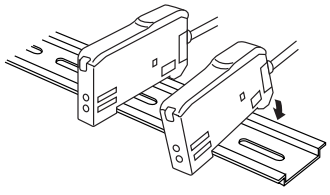
1. Slide the slave Amplifier Unit(s) for which the Connector is to be removed away from the rest of the group.
2. After the Amplifier Unit(s) has been separated, press down on the lever on the Connector and remove it. (Do not attempt to remove Connectors without separating them from other Amplifier Units first.)



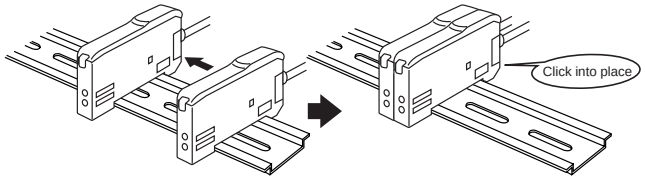

#### ● Joining and Removing Amplifier Units

**Joining 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.




**Separating Amplifier Units**

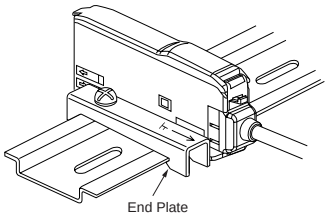
Slide Amplifier Units away from each other, and remove from the DIN track one at a time. (Do not attempt to remove Amplifier Units from the DIN track without separating them first.)

**Note 1.** The specifications for ambient temperature will vary according to the number of Amplifier Units used together. For details, refer to *Ratings/Characteristics*.

**2.** Always turn OFF the power supply before joining or separating Amplifier Units.

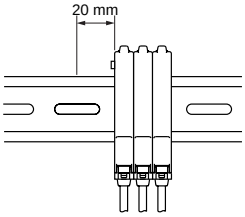
#### ● Mounting the End Plate (PFP-M)

An End Plate should be used if there is a possibility of the Amplifier Unit moving, e.g., due to vibration. If a Mobile Console is going to be mounted, connect the End Plate in the direction shown in the following diagram.




#### ● Mounting the Mobile Console Head

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

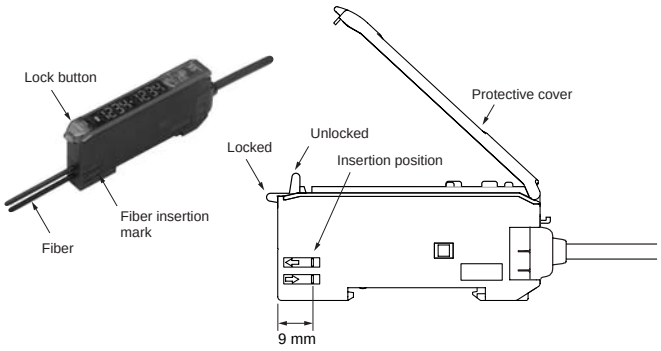


## ● Fiber Connection

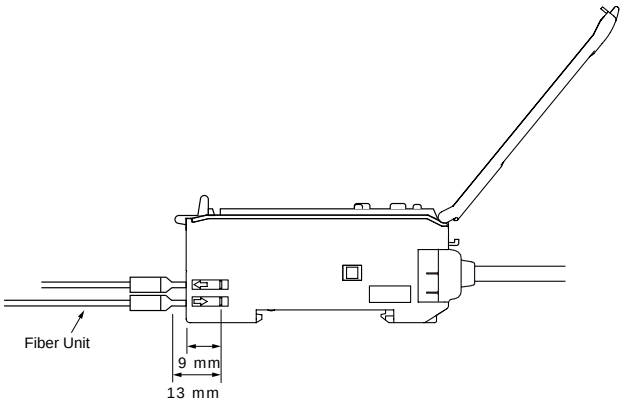
The E3X Amplifier Unit has a lock button for easy connection of the Fiber Unit. Connect or disconnect the fibers using the following procedures:

### 1. Connection

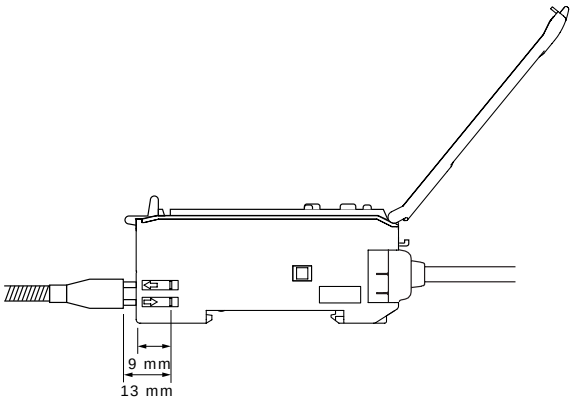
Open the protective cover, insert the fibers according to the fiber insertion marks on the side of the Amplifier Unit, and lower the lock button.




**Fibers with E39-F9 Attachment**

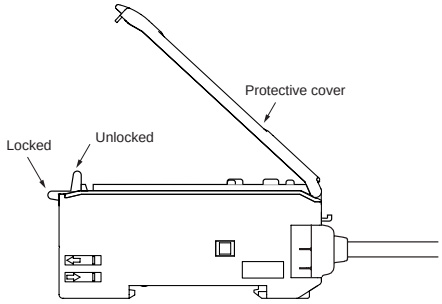



**Fibers That Cannot Be Free-Cut (with Sleeves)**




### 2. Disconnecting Fibers

Remove the protective cover and raise the lock button 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.

# Adjustments

## ● 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., decrease the power or 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 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.

# Other Precautions

## ● Protective Cover

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

## ● Mobile Console

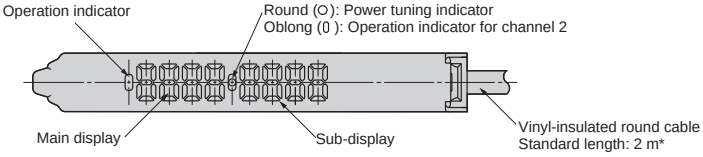
Use the E3X-MC11-S Mobile Console for the E3X-DA-S-series Amplifier Units. Other Mobile Consoles, such as the E3X-MC11, cannot be used.

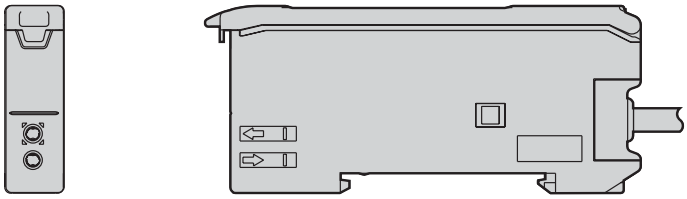
# Dimensions

## ■ Amplifier Units

### Amplifier Units with Cables

**E3X-DA11-S**
**E3X-DA41-S**
**E3X-DAG11-S**
**E3X-DAG41-S**
**E3X-DAB11-S**
**E3X-DAB41-S**
**E3X-DA11RM-S**
**E3X-DA41RM-S**
**E3X-DA11TW-S**
**E3X-DA41TW-S**

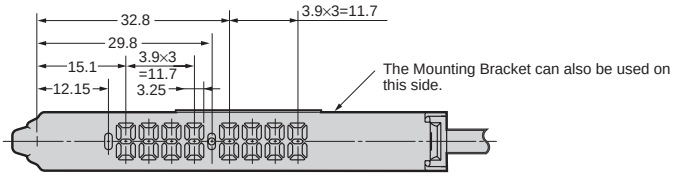


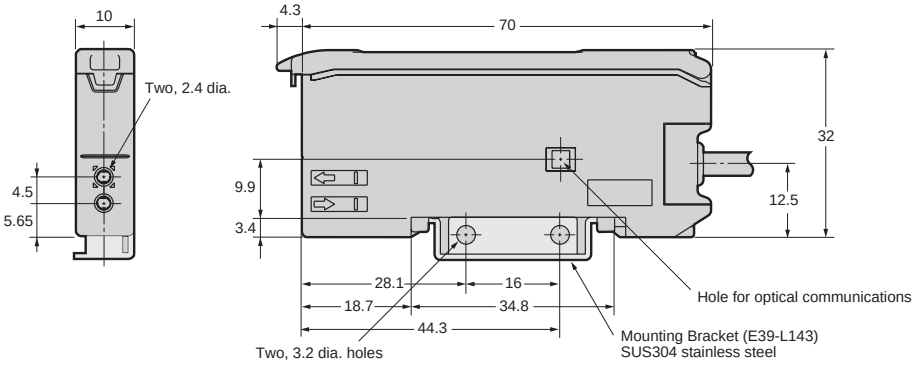



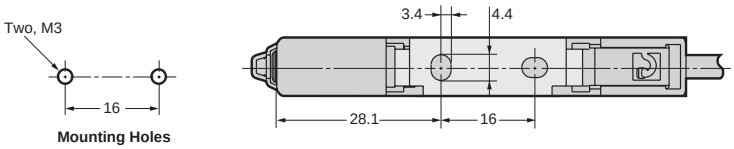
*Cable Specifications

| | |
|---|---|
| E3X-DA11-S/DA41-S/DAG11-S/ DAG41-S/DAB11-S/DAB41-S | A 4-dia., 3-conductor (conductor cross-sectional area: 0.2 mm$^2$; insulation diameter: 1.1 mm) |
| E3X-DA11TW-S/DA41TW-S/ DA11RM-S/DA41RM-S | A 4-dia., 4-conductor (conductor cross-sectional area: 0.2 mm$^2$; insulation diameter: 1.1 mm) |

**With Mounting Bracket Attached**



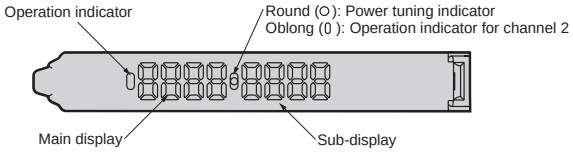



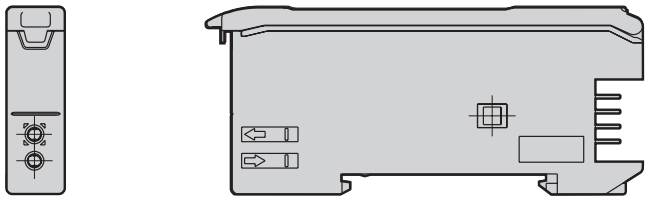




**Mounting Holes**

## Amplifier Units with Connectors

**E3X-DA6-S**
**E3X-DA8-S**
**E3X-DAG6-S**
**E3X-DAG8-S**
**E3X-DAB6-S**
**E3X-DAB8-S**
**E3X-DA6RM-S**
**E3X-DA8RM-S**
**E3X-DA6TW-S**
**E3X-DA8TW-S**

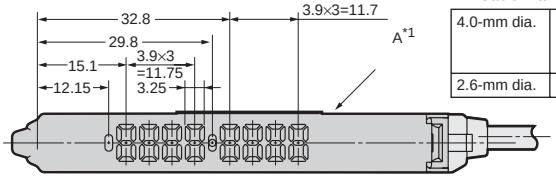


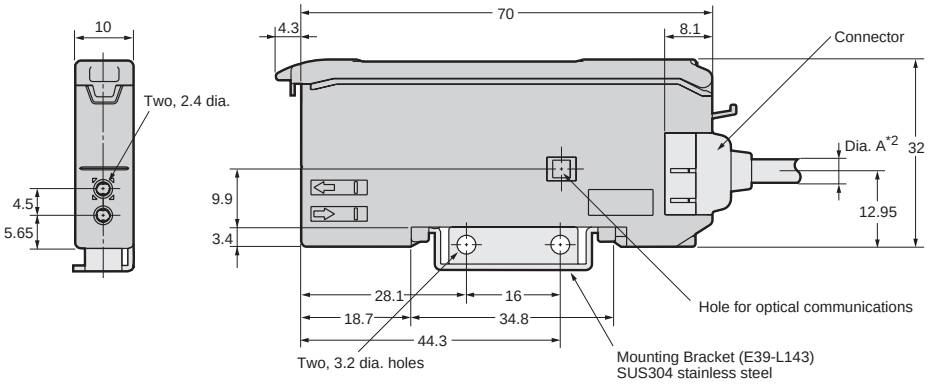



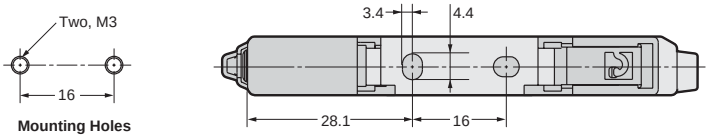
*1 The Mounting Bracket can also be used on this side.
*2 Cable Diameters

| | |
|---|---|
| 4.0-mm dia. | E3X-CN11 (3 conductors)<br>E3X-CN21 (4 conductors)<br>E3X-CN22 (2 conductors) |
| 2.6-mm dia. | E3X-CN12 (1 conductor) |

**With Mounting Bracket Attached**



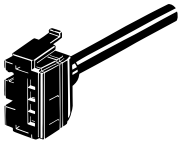



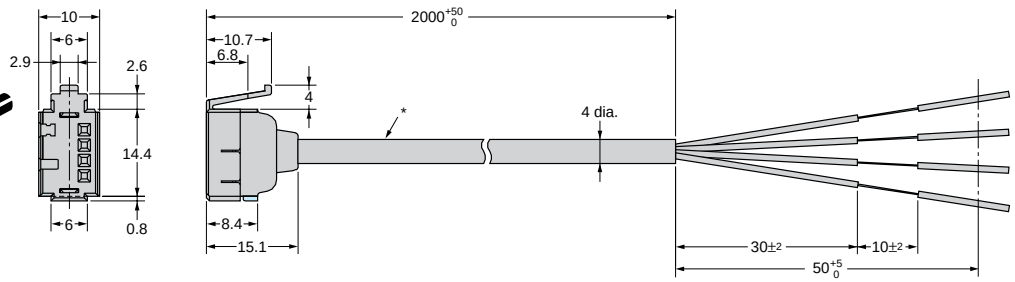

**Mounting Holes**

# ■ Amplifier Unit Connectors

## Master Connectors

**E3X-CN11**
**E3X-CN21**

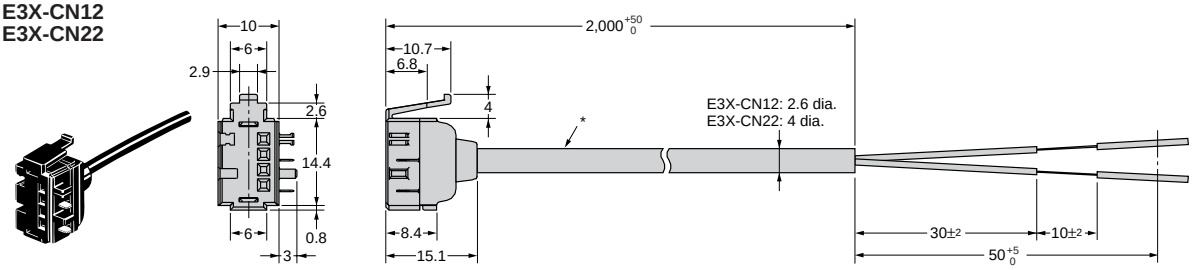





*E3X-CN11: A 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm$^2$; insulation diameter: 1.1 mm) is used.
E3X-CN21: A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm$^2$; insulation diameter: 1.1 mm) is used.

## Slave Connectors

**E3X-CN12**
**E3X-CN22**

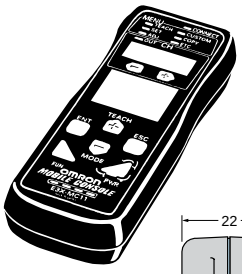



*E3X-CN12: A 2.6-dia., single-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm$^2$; insulation diameter: 1.1 mm) is used.

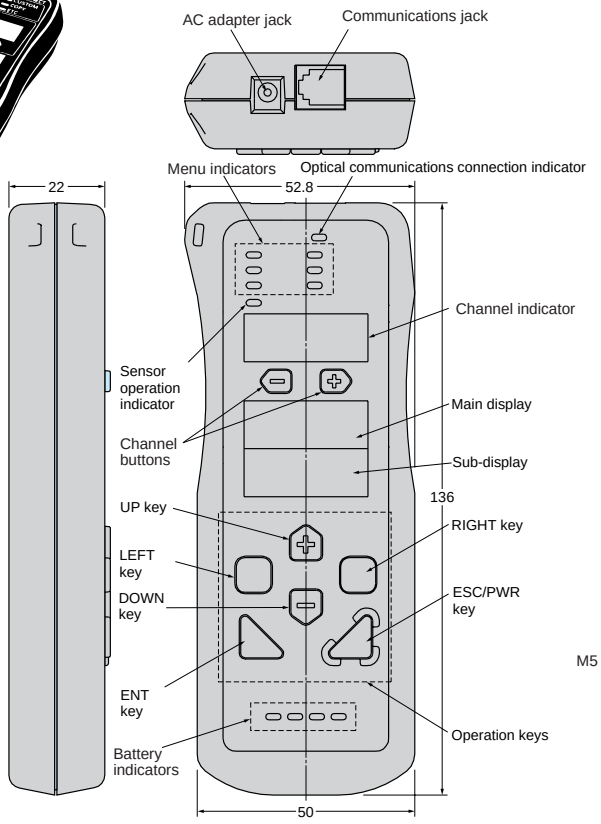
E3X-CN22: A 4-dia., 2-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm$^2$; insulation diameter: 1.1 mm) is used.

# ■ Mobile Console

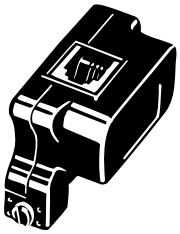
**E3X-MC11-S**

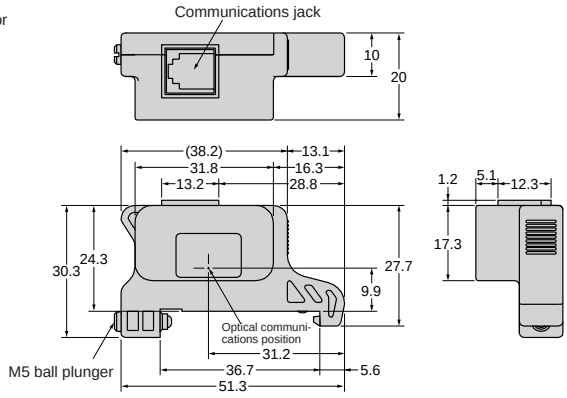


**Mobile Console**




**Mobile Console Head**





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