OMRON

Best Selection

# Fiber Sensor Best Selection Catalog

Measurement Judgement Presence

## Start with Smart!

**Easily select the most reliable Fiber Unit for your detection conditions.**



NEW

Smart Fiber Amplifier Units

**E3X-HD**



NEW

Communications Units

**E3X-CRT** **E3X-ECT**



CompoNet™ EtherCAT®

realizing

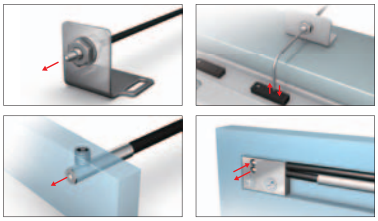

Fiber Sensor Features 2 Page
Selection Guide 4 Page
Fiber Units
Standard Installation 6 Page
Saving Space 14 Page
Beam Improvements 18 Page
Transparent Objects 32 Page
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Applications 46 Page
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Fiber Amplifiers, Communications Unit, and Accessories 60 Page
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Model Index 84 Page

# Easy

## "Mounts Anywhere"

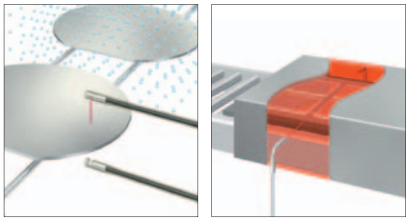
### Wide Variety

Variously-shaped, compact heads allow installation in any small space.



### Suitable for Harsh Environments

Fiber Units are available for various installation conditions and can be installed as is, even in harsh environments.



## "Easy and Optimum Settings for Anyone"

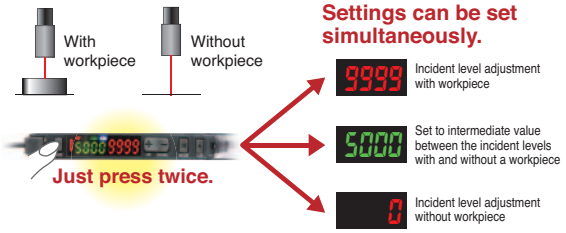
### Universal Design

Anyone can easily set it regardless of the language, the age or the skill level.



### Smart Tuning

Automatically find the optimum settings with the single button.




## "Smooth Wiring and Setting"

### Joining Installation

No wiring is required to join Fiber Amplifier Units together.

### Simple Communications

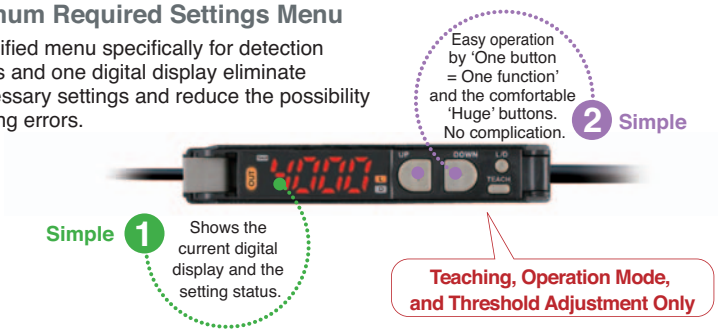
Setting changes and read-out are easy with the communications.




## "Simplified Setup"

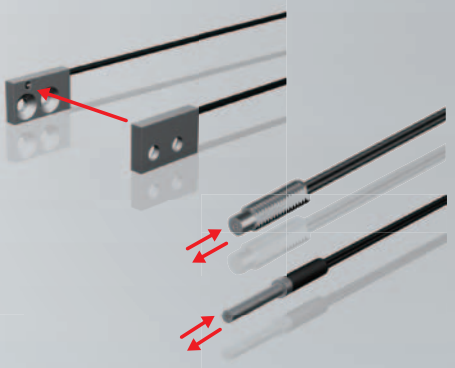
### Minimum Required Settings Menu

A simplified menu specifically for detection settings and one digital display eliminate unnecessary settings and reduce the possibility of setting errors.




## Optimal Fiber Sensor for additional

Fiber Units for various Installation Conditions,



NEW

**Smart Fiber Amplifier Units (Advanced Models)**

**E3X-HD**

60, 64 Page




**Simple Fiber Amplifier Units (Simple Models)**

**E3X-SD**

61, 72 Page

**Fiber**

**'Easy' and 'Stable' for**

installation when starting production.

Fiber Amolifier Units with easy optimum setting

# Stable

## Fiber Units
## E32

06 Page

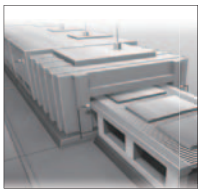



## "Extremely Stable Detection, Essentially No Maintenance"

### Highest Power in Its Class

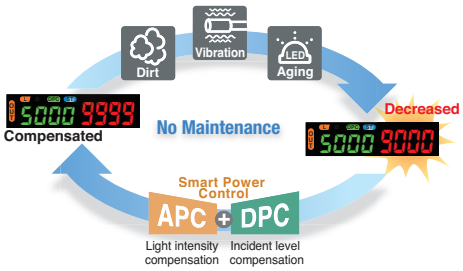
More precise detection for low-reflective / large workpieces compare to the conventional models.





### Smart Power Control

Long-term stable detection with no maintenance.




NEW

## Communications Units
## E3X-CRT/ECT

61, 70 Page




## Basic Features of Fiber Sensors

**The Amplifier Units can be installed in one place together regardless of the number of the detection parts.**



**Digital display achieves visual control and quantitative control.**

**Conventional Photoelectric Sensor with Built-in Amplifier**

Set the threshold by a sensitivity adjuster / Check the operation by an indicator.




- Ambiguous standard (e.g., 3/4 turn of adjuster)
- Indicator does not show the present value.

**Fiber Sensor**

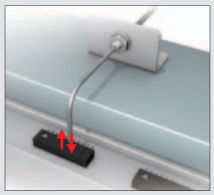
Quantitative control over threshold settings with a digital display.



- The reference value can be set numerically for easier specification.
- Easily perceivable present value.

**Ideal for narrow spaces or for detecting minute objects.**





# Sensor

## Minimal Cost Process.

## Select of new adoption product
## Selection by Category

**STEP 1**

### Select a Fiber Unit.

Select a category. Fiber Unit Index 05 Page

Select a model. Category Pages 06 to 59 Page

**STEP 2**

### Select a Fiber Amplifier Unit and Communications Unit.

60 Page

**STEP 3**

### Select Accessories of Fiber Amplifier Unit

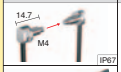
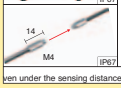
63 Page

### Before Selecting Fiber Units

The Fiber Units specifications give the sensing distance when the Fiber Unit and Fiber Amplifier Unit is combined. Check the Fiber Amplifier Unit series for easier selection.

**<Specifications on Each Fiber Unit Category Page>**

h-beam Fiber Units

| Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 07 Dime N |
|---|---|---|---|---|---|---|---|
| | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | GIGA HS | Other modes | | | |
|  | Flexible, R1 | 530 | 2,000 | ST : 1,000 SHS: 280 | 1 dia. (5 µm dia.) | E32-T11N 2M | |
|  | | 560 | 700 | | | E32-T11R 2M | |

ven under the sensing distances has the following modes and response times.

### Fiber Amplifier Unit Series

| | | Simple Fiber Amplifier Unit E3X-SD Series  | Smart Fiber Amplifier Unit E3X-HD Series  |
|---|---|---|---|
| Digital displays | | Incident level (1 display, threshold display when setting) | Incident level + threshold (2 displays) |
| Functions | | Standard Models | Advanced Models |
| | SPC (Automatic Compensation) | None | Provided |
| | Timer | None | ON, OFF and One shot |
| | Communications Unit | Unsupported | Supported (CompoNet or EtherCAT) |
| Mutual interference prevention | | 5 Units | 10 Units |
| Response time | | 200 µs (Fixed) | 50µs (55µs)/250µs/1ms/16ms (Default: 250 µs) |
| Page listings | Ordering Information | 62 Page | |
| | Ratings and specifications | 72 Page | 64 Page (Communications Unit: 70 Page) |
| | Dimensions | 73 Page | 64 and 65 Page (Communications Unit: 71 Page) |

## Selection by Model

**STEP 1**

### Search for the page in the model index.

84 Page

**STEP 2**

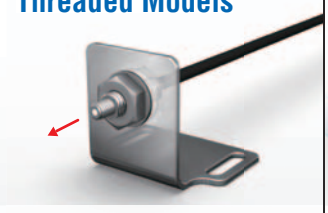
### Search for the model on the corresponding pages.

Each Page

## Fiber Unit Index

### Standard Installation

#### Threaded Models



Standard screw-type installation. The Fiber Units is mounted into a drilled hole and secured with nuts.

06 Page

#### Cylindrical Models



Ideal for installation in narrow spaces.
The Fiber Unit is secured with a set screw.

10 Page

### Saving Space

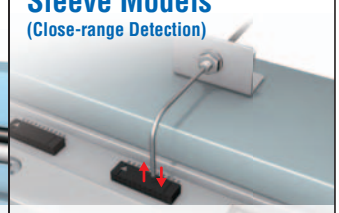
#### Flat Models



Mount directly in limited spaces without using special mounting brackets.

14 Page

#### Sleeve Models
(Close-range Detection)



Suitable for close-range detection.
Ideal for detecting minute objects in areas with limited space.

16 Page

### Beam Improvements

#### Small-Spot, Reflective
(Minute Object Detection)



Small-spot to accurately detect small objects.

18 Page

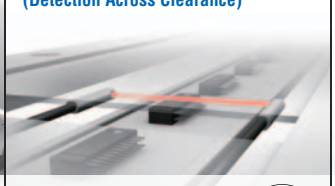
#### High-power Beam
(Long-distance Installation, Dust-resistant)



Suitable for detection on large equipment, of large objects, and in environments with airborne particles.

22 Page

#### Narrow View
(Detection Across Clearance)



The Fiber Unit emit a non-spreading beam to prevent false detection of light reflected off surrounding objects.

28 Page

#### Detection without Background Interference

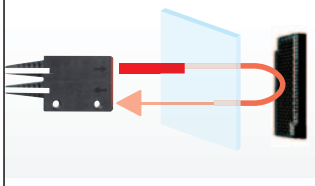


Detect only objects in the sensing range, and not in the background.

30 Page

### Transparent Object Detection

#### Retro-reflective



Detect transparent objects reliably because the beam passes through the object twice, resulting in greater light interruption.

32 Page

#### Limited-reflective
(Glass Detection)



The limited-reflective optical system provides stable detection of specular reflective glass.

34 Page

### Environmental Immunity

#### Chemical-resistant, Oil-resistant



Made from materials that are resistant to various oils and chemicals.

36 Page

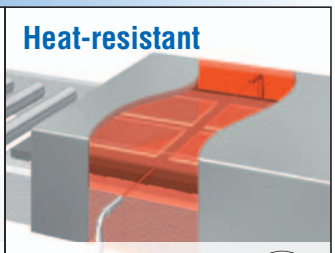
#### Bending-resistant, Disconnection-resistant



Resistant to repeated bending on moving parts and breaking from snagging or shock.

38 Page

#### Heat-resistant

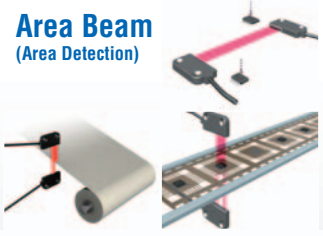


Can be used in high-temperature environments at up to 400°C.

42 Page

### Special Applications

#### Area Beam
(Area Detection)



Detect across areas for meandering materials or falling workpieces whose position vary.

46 Page

#### Liquid-level Detection



Detect only liquid when being mounted on tubes or in liquid.

48 Page

#### Vacuum-resistant



Can be used under high vacuums of up to $10^{-5}$ Pa.

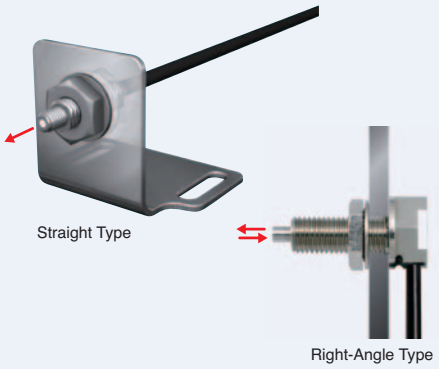
50 Page

#### FPD, Semiconductors, and Solar Cells

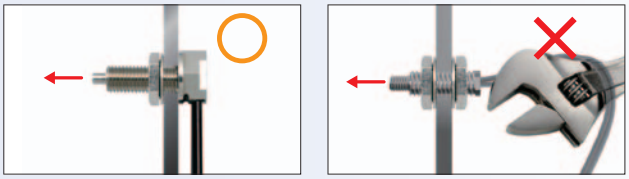


Designed specifically to reliably detect glass substrates and wafers.

52 Page

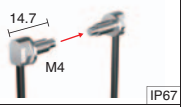
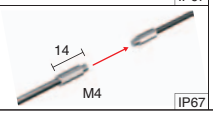



- Standard configuration. These Fiber Units are mounted into a hole drilled in a bracket and secured with nuts.
- The Right-angle Model prevents snagging on the cable because the cable runs along the mounting surface.



## Specifications

### Through-beam Fiber Units

| Sensing direction | Size | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 07 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Right-Angle | M4 |   | Flexible, R1 | 530 | 2,000 | ST : 1,000 | 1 dia. (5 µm dia.) | E32-T11N 2M | 07-A |
| Straight | |   | | 560 | 700 | SHS: 280 | | E32-T11R 2M | 07-B |

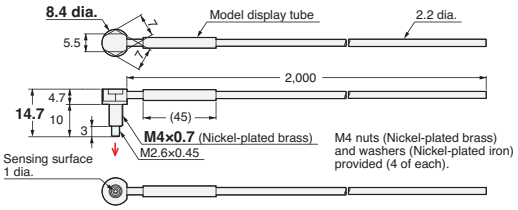
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.

## Dimensions

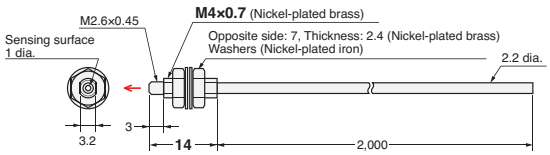
Installation Information → 58 Page

### Through-beam Fiber Units (Set of 2)

07-A E32-T11N 2M (Free Cutting)




07-B E32-T11R 2M (Free Cutting)



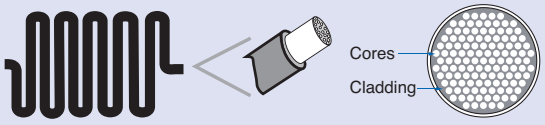

## - Reference Information for Model Selection -

### Features of the Right-angle Type

- Cable is less prone to snagging.
- Cable runs along the mounting surface for less space compared with straight Fiber Units.
- The nut is attached to the Fiber Unit to reduce installation work.

### What Is "Flexible" Fiber?

The flexible fiber has a small bending radius for easy routing without easily breaking.
It is easy to use because the cable can be bent without significantly reducing light intensity.




Structure which has a cladding around a large number of ultrafine cores.

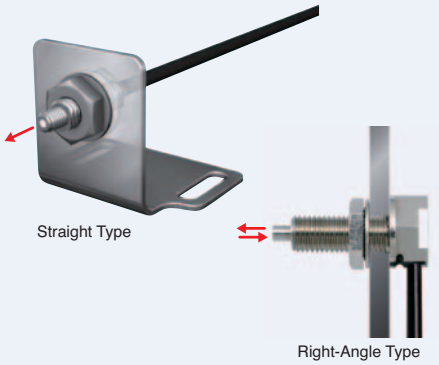
And

### Long-distance Sensing Applications

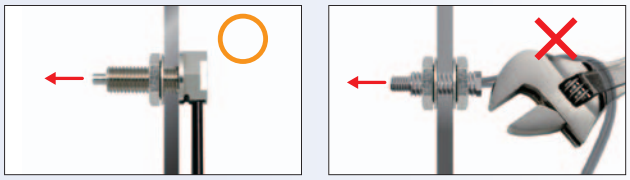
A separate Lens Unit can be attached to extend the sensing distance.
→ 24 Page

### Breaking Due to Snagging or Shock

The Fiber Unit can be protected from breaking with stainless steel spiral tube.
→ 38 Page (Only E32-T11R 2M)




- Standard configuration. These Fiber Units are mounted into a hole drilled in a bracket and secured with nuts.
- The Right-angle Model prevents snagging on the cable because the cable runs along the mounting surface.



## Specifications

### Reflective Fiber Units

| Sensing direction | Size | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 09 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA / HS | Other modes | | | |
| Right-Angle | M3 | Coaxial, 20.5, M3, IP67 | Flexible, R4 | 25 | 110 / 46 | ST : 50<br>SHS: 14 | (5 µm dia.) | E32-C31N 2M | 09-A |
| | M6 | Coaxial, 24, M6, IP67 | | 170 | 780 / 320 | ST : 350<br>SHS: 100 | | E32-C11N 2M | 09-B |
| Straight | M3 | 11, M3, IP67 | Flexible, R1 | 30 | 140 / 40 | ST : 60<br>SHS: 16 | | E32-D21R 2M | 09-C |
| | | Coaxial, 25, M3, IP67 | R25 | 80 | 330 / 100 | ST : 150<br>SHS: 44 | | E32-C31 2M | 09-D |
| | | Coaxial, 11, M3, IP67 | R10 | 80 | 330 / 100 | ST : 150<br>SHS: 44 | | E32-C31M 1M NEW | 09-E |
| | M4 | 15, M4, IP67 | Flexible, R1 | 30 | 140 / 40 | ST : 60<br>SHS: 16 | | E32-D211R 2M | 09-F |
| | M6 | 17, M6, IP67 | | 180 | 840 / 240 | ST : 350<br>SHS: 100 | | E32-D11R 2M | 09-G |
| | | Coaxial, 23, M6, IP67 | R25 | 300 | 1,400 / 400 | ST : 600<br>SHS: 180 | | E32-CC200 2M | 09-H |

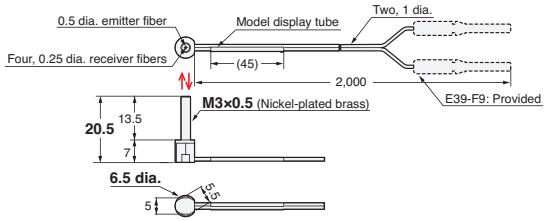
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

# Dimensions

Installation Information → 56 Page

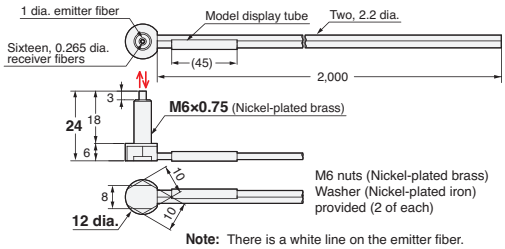
## Reflective Fiber Units

### 09-A E32-C31N 2M (Free Cutting)



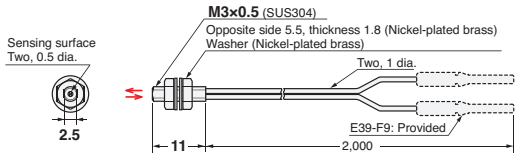

**Note:** There is a white line on the emitter fiber.
M3 nuts (Nickel-plated brass)
Washer (Nickel-plated brass) provided (2 of each)

### 09-B E32-C11N 2M (Free Cutting)

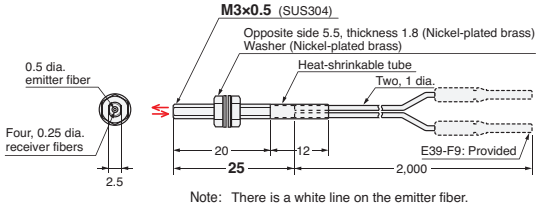



**Note:** There is a white line on the emitter fiber.

### 09-C E32-D21R 2M (Free Cutting)

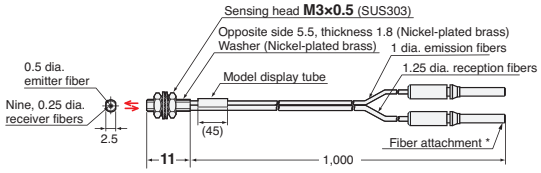



### 09-D E32-C31 2M (Free Cutting)




Note: There is a white line on the emitter fiber.

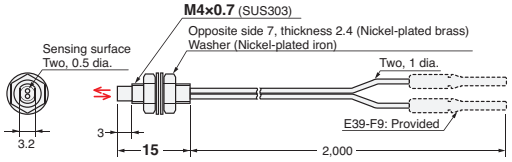
### 09-E E32-C31M 1M (Free Cutting)



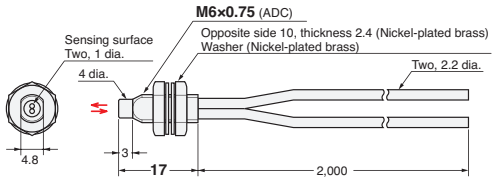

**Note:** There is a white line on the emitter fiber.

* The Fiber Attachments that are provided were specially designed for this Fiber Unit.
E39-F9 cannot be attached.

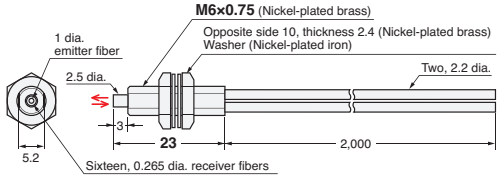
### 09-F E32-D211R 2M (Free Cutting)




### 09-G E32-D11R 2M (Free Cutting)




### 09-H E32-CC200 2M (Free Cutting)

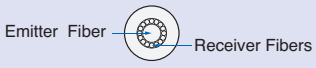



Note: There is a white line on the emitter fiber.

## - Reference Information for Model Selection -

### Features of Coaxial Reflective Type

These Fiber Units offer better detection of small objects at close distances (of 2 mm or less) than Standard Reflective Fiber Units.
They also detect glossy surfaces more reliably than Standard Reflective Fiber Units, even if the surface is tilted.
The receiver fibers are arranged around the emitter fiber as shown below.

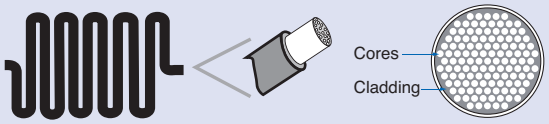



### Features of the Right-angle Type

- Cable is less prone to snagging.
- Cable runs along the mounting surface for less space compared with straight Fiber Units.
- The nut is attached to the Fiber Unit to reduce installation work.

### What Is "Flexible" Fiber?

The flexible fiber has a small bending radius for easy routing without easily breaking.
It is easy to use because the cable can be bent without significantly reducing light intensity.

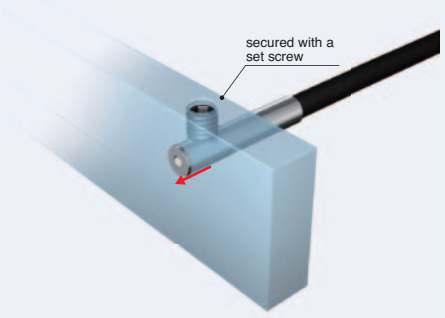



Structure which has a cladding around a large number of ultrafine cores.

**And**

### Breaking Due to Snagging or Shock

The Fiber Unit can be protected from breaking with stainless steel spiral tube.
→ 40 Page

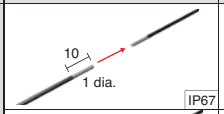
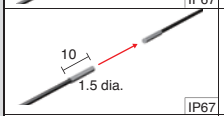
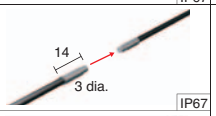
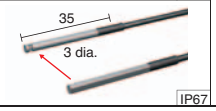



- Inserted where space is limited.
  (Secured using a set screw.)
- Ultramate space-saving by micro-fiber head. (1 dia. × 10 mm)




## Specifications

### Through-beam Fiber Units

| Size | Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 11 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| 1 dia. | Top-View |   | Flexible, R1 | 120 | 450 / 150 | ST : 250 SHS: 60 | 0.5 dia. (5 μm dia.) | E32-T223R 2M | 11-A |
| 1.5 dia. | |   | Bend-resistant, R4 | 200 | 680 / 220 | ST : 400 SHS: 90 | | E32-T22B 2M | 11-B |
| 3 dia. | |   | Flexible, R1 | 560 | 2,000 / 700 | ST : 1,000 SHS: 280 | 1 dia. (5 μm dia.) | E32-T12R 2M | 11-C |
| | Side-View |   | | 220 | 750 / 260 | ST : 450 SHS: 100 | | E32-T14LR 2M | 11-D |

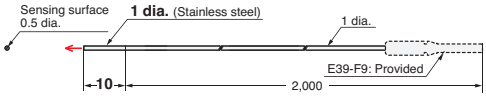
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.

## Dimensions

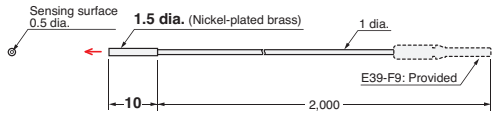
Installation Information → 58 Page

### Through-beam Fiber Units (Set of 2)

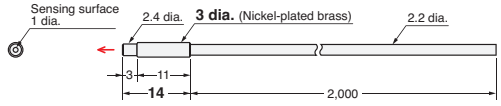
**11-A E32-T223R 2M (Free Cutting)**



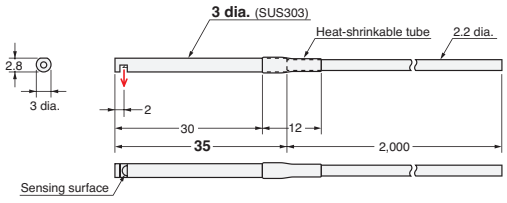

**11-B E32-T22B 2M (Free Cutting)**




**11-C E32-T12R 2M (Free Cutting)**



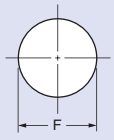

**11-D E32-T14LR 2M (Free Cutting)**




## - Reference Information for Model Selection -

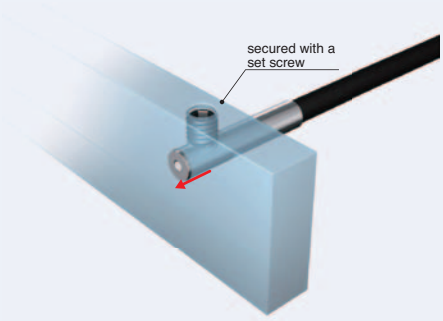
### Recommended Mounting Hole Dimensions

The recommended mounting-hole dimensions for Cylindrical Fiber Units are given below.




(Unit: mm)

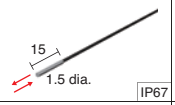
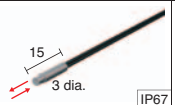
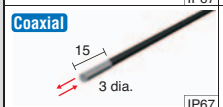
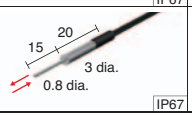
| Outer diameter of Fiber Unit | 1 dia. | 1.5 dia. | 3 dia. |
|---|---|---|---|
| Dimension F | 1.2 $^{+0.5}_{0}$ dia. | 1.7 $^{+0.5}_{0}$ dia. | 3.2 $^{+0.5}_{0}$ dia. |




- Inserted where space is limited.
  (Secured using a set screw.)

## Specifications

### Reflective Fiber Units

| Size | Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 13 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| 1.5 dia. | Top-View |   | Bend-resistant, R4 | 30 | 140 / 40 | ST : 60 SHS: 16 | (5 μm dia.) | E32-D22B 2M | 13-A |
| 1.5 dia. + 0.5 dia. | |   | R4 | 6 | 28 / 8 | ST : 12 SHS: 4 | | E32-D43M 1M NEW | 13-B |
| 3 dia. | |   | Flexible, R1 | 30 | 140 / 40 | ST : 60 SHS: 16 | | E32-D22R 2M | 13-C |
| | |   | Bend-resistant, R4 | 70 | 300 / 90 | ST : 140 SHS: 40 | | E32-D221B 2M | 13-D |
| | |   | R25 | 160 | 700 / 200 | ST : 300 SHS: 90 | | E32-D32L 2M | 13-E |
| 3 dia. + 0.8 dia. | |   | R4 | 16 | 70 / 20 | ST : 30 SHS: 8 | | E32-D33 2M | 13-F |

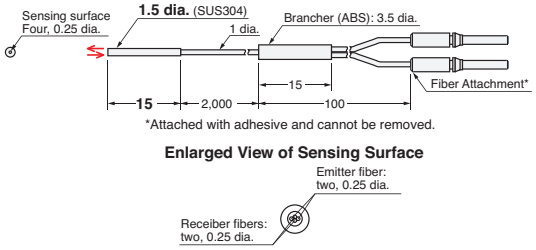
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

## Dimensions

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## Reflective Fiber Units

### 13-A E32-D22B 2M (No Cutting)

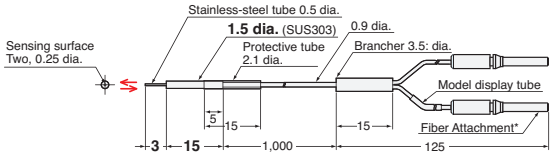



*Attached with adhesive and cannot be removed.

**Enlarged View of Sensing Surface**

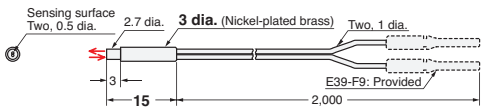



### 13-B E32-D43M 1M (No Cutting)

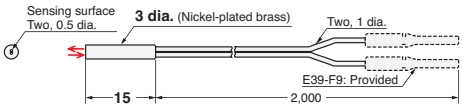



* Attached with adhesive and cannot be removed.

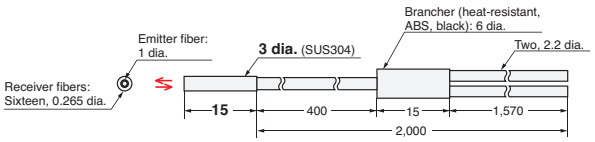
### 13-C E32-D22R 2M (Free Cutting)




### 13-D E32-D221B 2M (Free Cutting)

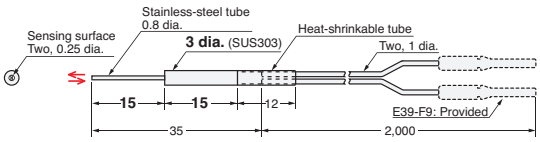



### 13-E E32-D32L 2M (Free Cutting)




**Note:** There is a yellow dotted line on the Emitter fiber.

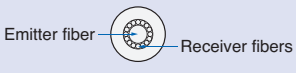
### 13-F E32-D33 2M (Free Cutting)




## - Reference Information for Model Selection -

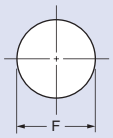
### Features of Coaxial Reflective Type

These Fiber Units offer better detection of small objects at close distances (of 2 mm or less) than Standard Reflective Fiber Units.
They also detect glossy surfaces more reliably than Standard Reflective Fiber Units, even if the surface is tilted.
The receiver fibers are arranged around the emitter fiber as shown below.



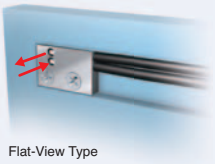

### Recommended Mounting Hole Dimensions

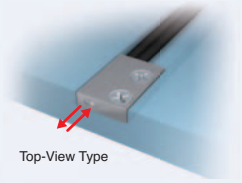
The recommended mounting-hole dimensions for Cylindrical Fiber Units are given below.

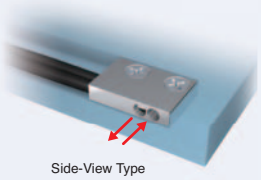



(Unit: mm)

| Outer diameter of Fiber Unit | 1.5 dia. | 3 dia. |
|---|---|---|
| Dimension F | 1.7 $^{+0.5}_{0}$ dia. | 3.2 $^{+0.5}_{0}$ dia. |


Flat-View Type

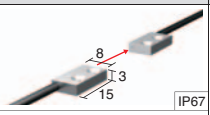
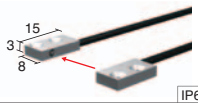
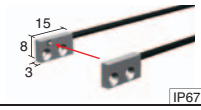

Top-View Type


Side-View Type

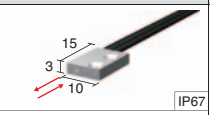
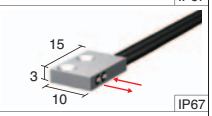
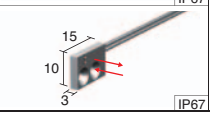
- Thin profile for mounting in limited spaces.
- Mounts directly without using special mounting brackets.

## Specifications

### Through-beam Fiber Units

| Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 15 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA HS | Other modes | | | |
| Top-View |  IP67 | Flexible, R1 | 560 | 2,000<br>700 | ST : 1,000<br>SHS: 280 | 1 dia. (5 µm dia.) | E32-T15XR 2M | 15-A |
| Side-View |  IP67 | | 220 | 750<br>260 | ST : 450<br>SHS: 100 | | E32-T15YR 2M | 15-B |
| Flat-View |  IP67 | | 220 | 750<br>260 | ST : 450<br>SHS: 100 | | E32-T15ZR 2M | 15-C |

### Reflective Fiber Units

| Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 15 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA HS | Other modes | | | |
| Top-View |  IP67 | Flexible, R1 | 180 | 840<br>240 | ST : 350<br>SHS: 100 | (5 µm dia.) | E32-D15XR 2M | 15-D |
| Side-View |  IP67 | | 40 | 200<br>52 | ST : 100<br>SHS: 24 | | E32-D15YR 2M | 15-E |
| Flat-View |  IP67 | | 40 | 200<br>52 | ST : 100<br>SHS: 24 | | E32-D15ZR 2M | 15-F |

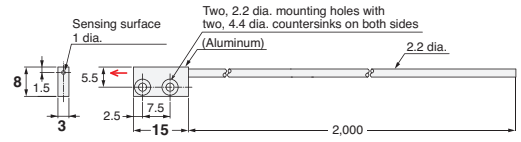
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

## Dimensions

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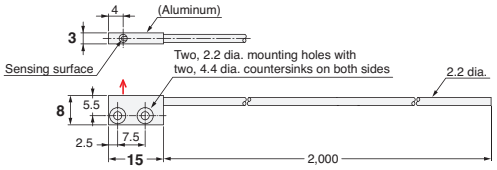
### Through-beam Fiber Units (Set of 2)

#### 15-A E32-T15XR 2M (Free Cutting)



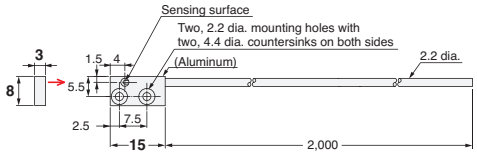

**Note: 1.** Set of two symmetrically shaped Fiber Units.
**2.** Four, M2 × 8 stainless steel countersunk mounting screws are provided.

#### 15-B E32-T15YR 2M (Free Cutting)




**Note: 1.** Set of two symmetrically shaped Fiber Units.
**2.** Four, M2 × 8 stainless steel countersunk mounting screws are provided.

#### 15-C E32-T15ZR 2M (Free Cutting)

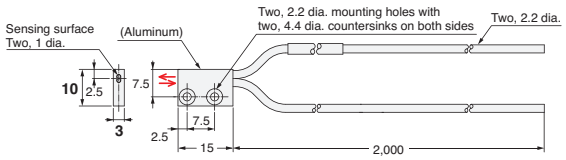



**Note: 1.** Set of two symmetrically shaped Fiber Units.
**2.** Four, M2 × 8 stainless steel countersunk mounting screws are provided.

Installation Information → 56 Page

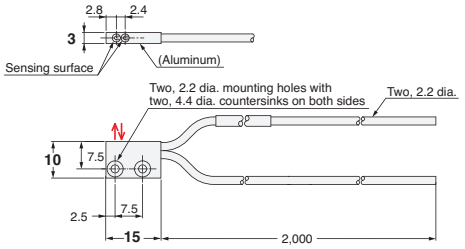
### Reflective Fiber Units

#### 15-D E32-D15XR 2M (Free Cutting)



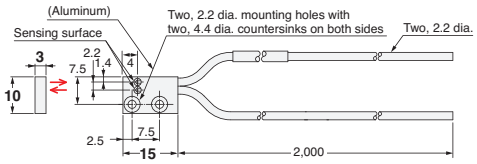

**Note:** Two, M2 × 8 stainless steel countersunk mounting screws are provided.

#### 15-E E32-D15YR 2M (Free Cutting)

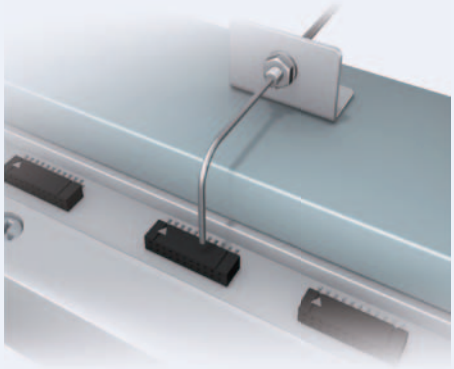



**Note:** Two, M2 × 8 stainless steel countersunk mounting screws are provided.

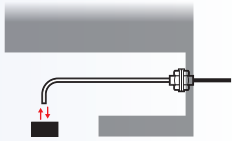
#### 15-F E32-D15ZR 2M (Free Cutting)




**Note:** Two, M2 × 8 stainless steel countersunk mounting screws are provided.

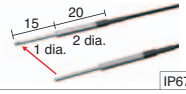
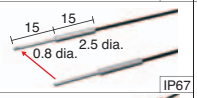
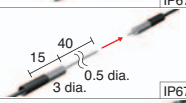
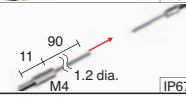


- Sleeve Fiber Units allow detection away from the point of installation for stable close-range detection of small objects.
- The shape of sleeve can be changed freely.

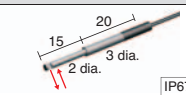
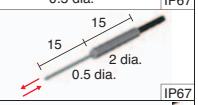
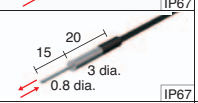
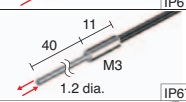
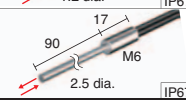


## Specifications

### Through-beam Fiber Units

| Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 17 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA / HS | Other modes | | | |
| Side-View |   | Flexible, R1 | 60 | 170 / 50 | ST : 100 SHS: 20 | 0.5 dia. (5 µm dia.) | E32-T24R 2M | 17-A |
| |   | R10 | 180 | 450 / 150 | ST : 250 SHS: 60 | | E32-T24E 2M NEW | 17-B |
| Top-View |   | | 40 | 150 / 50 | ST : 90 SHS: 20 | 0.25 dia. (5 µm dia.) | E32-T33 1M | 17-C |
| |   | Flexible, R1 | 560 | 2,000 / 700 | ST : 1,000 SHS: 280 | 1 dia. (5 µm dia.) | E32-TC200BR 2M | 17-D |

### Reflective Fiber Units

| Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 17 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA / HS | Other modes | | | |
| Side-View |   | Flexible, R1 | 14 | 70 / 20 | ST : 30 SHS: 8 | (5 µm dia.) | E32-D24R 2M | 17-E |
| Top-View |   | R4 | 6 | 28 / 8 | ST : 12 SHS: 4 | | E32-D43M 1M NEW | 17-F |
| |   | | 3 | 14 / 4 | ST : 6 SHS: 2 | | E32-D331 2M | 17-G |
| |   | | 16 | 70 / 20 | ST : 30 SHS: 8 | | E32-D33 2M | 17-H |
| |   | Flexible, R1 | 30 | 140 / 40 | ST : 60 SHS: 16 | | E32-DC200F4R 2M | 17-I |
| |   | | 180 | 840 / 240 | ST : 350 SHS: 100 | | E32-DC200BR 2M | 17-J |

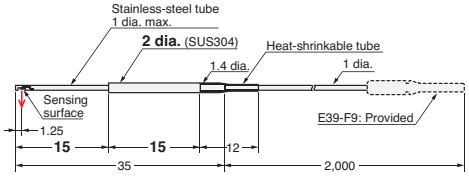
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

# Dimensions

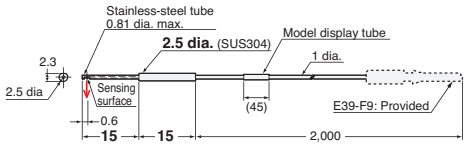
Installation Information → 58 and 59 Page

## Through-beam Fiber Units (Set of 2)

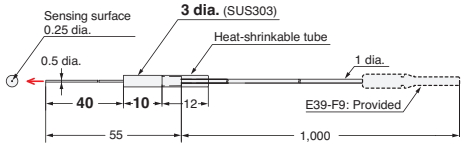
### 17-A E32-T24R 2M (Free Cutting)



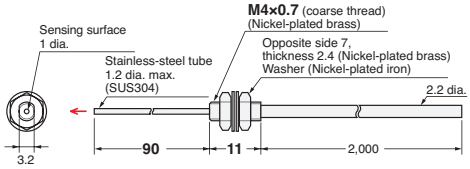

### 17-B E32-T24E 2M (Free Cutting)




### 17-C E32-T33 1M (Free Cutting)



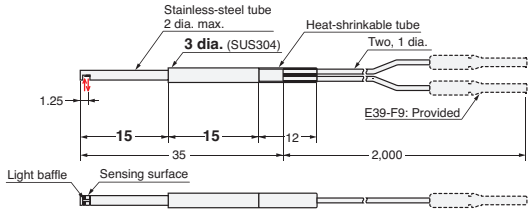

### 17-D E32-TC200BR 2M (Free Cutting)



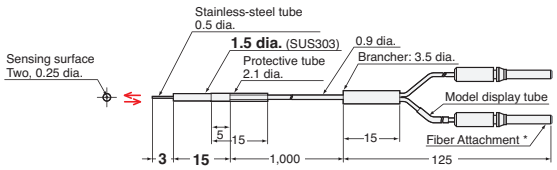

Installation Information → 57 Page

## Reflective Fiber Units

### 17-E E32-D24R 2M (Free Cutting)

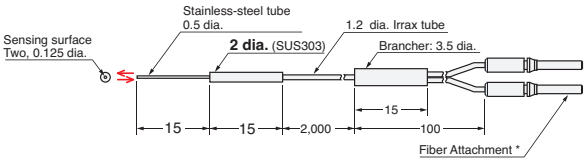



### 17-F E32-D43M 1M (No Cutting)



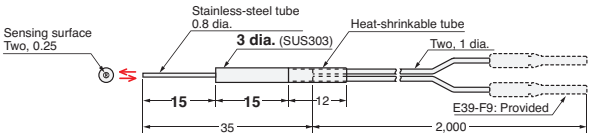

*Attached with adhesive and cannot be removed.

### 17-G E32-D331 2M (No Cutting)

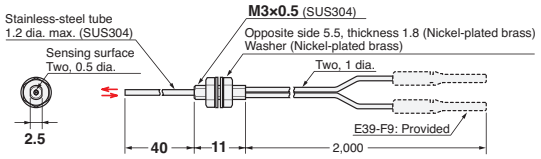



*Attached with adhesive and cannot be removed.

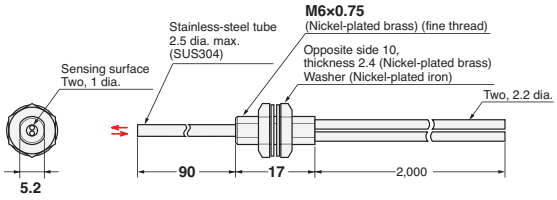
### 17-H E32-D33 2M (Free Cutting)




### 17-I E32-DC200F4R 2M (Free Cutting)




### 17-J E32-DC200BR 2M (Free Cutting)




## - Reference Information for Model Selection -

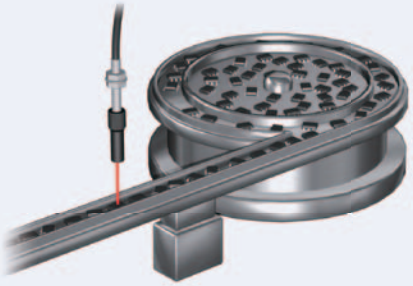
**And**

### In case of bending sleeve

The E32-TC200BR and E32-DC200F4R have bendable sleeves.
Use the Sleeve Bender to bend them.

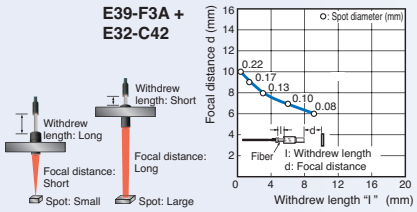
**Sleeve Bender (sold separately)**

| Appearance | Applicable Fiber Units | Model |
|---|---|---|
|  Uses for the bending of the sleeve. | E32-TC200BR<br>E32-DC200F4R | E39-F11 |

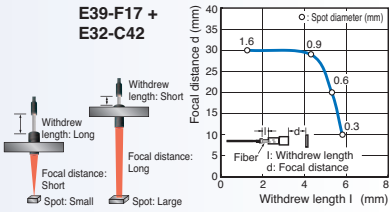


- Small-spot is ideal for detecting minute objects.
  Select the Fiber Unit that is best suited for the workpiece size and installation distance.
  (Refer to Reference Information for Model Selection)
- Available with a variable-spot Lens Unit to change the spot diameter without replacing the fiber. The spot diameter can be adjusted according to the size of the workpiece by changing the withdrew length and sensing distance.
  Refer to the following graph, which shows the relation between the withdrew length, focal distance, and spot diameter.

**E39-F3A + E32-C42**




**E39-F17 + E32-C42**




* Withdrew length: Approx. 1.3 to 5.8 mm

## Specifications

### Reflective Fiber Units

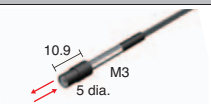
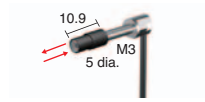
#### Variable-spot types

#### Lens Units + Fiber Unit

| Type | Spot diameter | Center distance (mm) | Lens Units | Lens Units + Fiber Units | Fiber Unit | | 19 Page Dimensions No. |
|---|---|---|---|---|---|---|---|
| | | | Models | Appearance | Bending radius of cable | Model | |
| Variable spot | 0.1 to 0.6 dia. | 6 to 15 | E39-F3A |   | R25 | E32-C42 1M | 19-A |
| | 0.3 to 1.6 dia. | 10 to 30 | E39-F17 |   | | | 19-B |

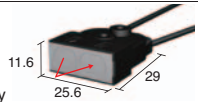
#### Parallel-light-spot types

#### Lens Unit + Fiber Units

| Type | Spot diameter | Center distance (mm) | Lens Unit | Lens Units + Fiber Units | Fiber Units | | 19 Page Dimensions No. |
|---|---|---|---|---|---|---|---|
| | | | Model | Appearance | Bending radius of cable | Models | |
| Parallel light | 4 dia. | 0 to 20 | E39-F3C |   | R25 | E32-C31 2M | 19-C |
| | | | |   | Pliable, R4 | E32-C31N 2M | 19-D |

#### Small-spot types

#### Integrated Lens

| Type | Spot diameter | Center distance (mm) | Appearance | Bending radius of cable | Models | 19 Page Dimensions No. |
|---|---|---|---|---|---|---|
| Short-distance, Small-spot | 0.1 dia. | 5 |   Lens: unnecessary IP50 | R25 | E32-C42S 1M | 19-E |
| Long-distance, Small-spot | 6 dia. | 50 |   Lens: unnecessary IP50 | | E32-L15 2M | 19-F |

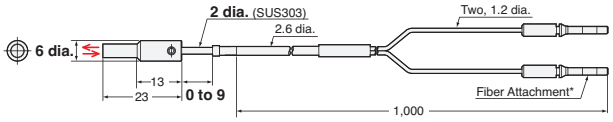
* The spot diameter and the center distance are same when using with E3X-HD series or E3X-SD series.

# Dimensions

Installation Information → 56, 57 and 58 Page

## Reflective Fiber Units

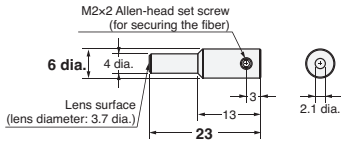
### 19-A E32-C42 1M (No Cutting) + E39-F3A




* Attached with adhesive and cannot be removed.

**Note:** There is a white tube on the emitter fiber.

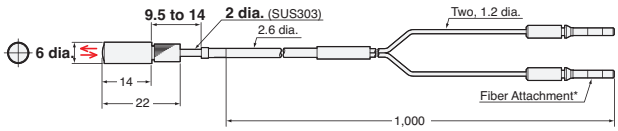
### E39-F3A




**Material:**
Aluminum for body and optical glass for lens.

**Note:** This is the Lens Unit for the E32-C42.

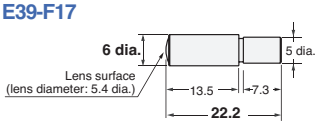
### 19-B E32-C42 1M (No Cutting) + E39-F17




* Attached with adhesive and cannot be removed.

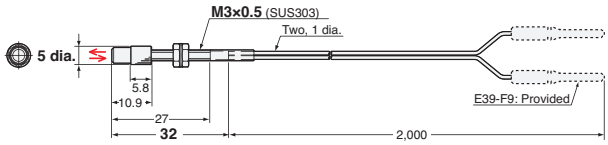
**Note:** There is a white tube on the emitter fiber.

### E39-F17



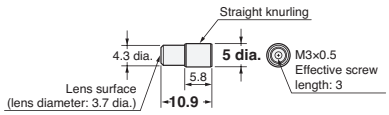

**Material:**
Aluminum for body and optical glass for lens.

### 19-C E32-C31 2M (Free Cutting) + E39-F3C




**Note:** There is a white line on the emitter fiber.

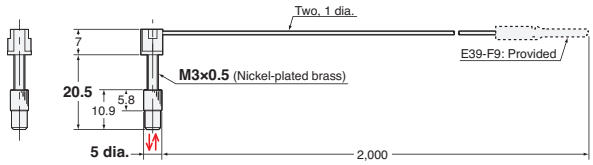
### E39-F3C




**Material:**
Aluminum for body and optical glass for lens.

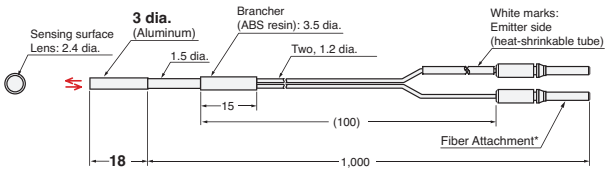
**Note:** This is the Lens Unit for the E32-C31 and E32-C31N.

### 19-D E32-C31N 2M (Free Cutting) + E39-F3C




**Note:** There is a white line on the emitter fiber.

### 19-E E32-C42S 1M (No Cutting)

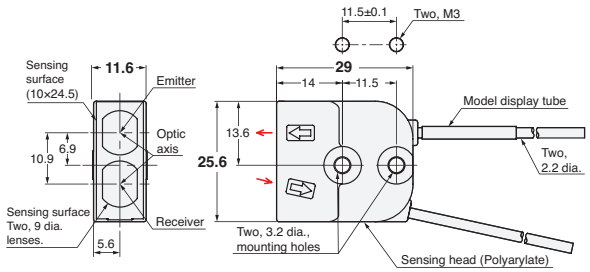



* Attached with adhesive and cannot be removed.

**Note:** There is a white tube on the emitter fiber.

### 19-F E32-L15 2M (Free Cutting)

**Mounting hole dimensions**




**Note:** There is a white tube on the emitter fiber.

## - Reference Information for Model Selection -

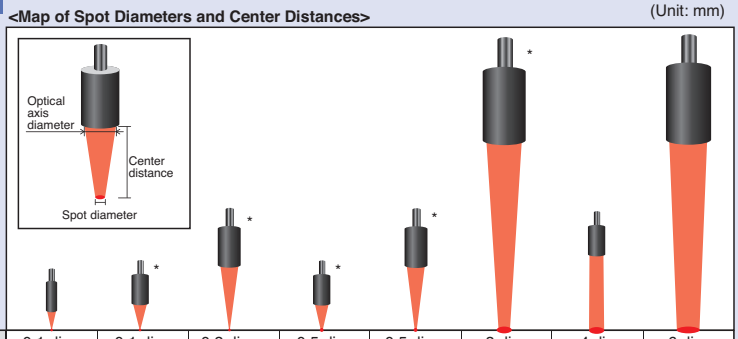
### Model Selection Tips

Select the best model by following these steps.

1. Select the model based on the spot diameter suitable for the workpiece size.
   * The Variable-spot Type is useful if there are different sensing object sizes.
2. Select the model based on the allowable installation distance and center distance.

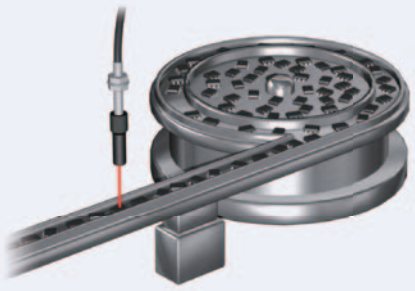
<Map of Spot Diameters and Center Distances>

(Unit: mm)




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Spot diameter | 0.1 dia. | 0.1 dia. | 0.2 dia. | 0.5 dia. | 0.5 dia. | 3 dia. | 4 dia. | 6 dia. |
| Center distance | 5 | 7 | 17 | 7 | 17 | 50 | 0 to 20 | 50 |
| Optical axis diameter | 2.4 | 3.7 | 4.8 | 3.7 | 4.8 | 9.4 | 3.7 | 10 |
| Models | E32-C42S | E39-F3A-5 + E32-C41 | E39-F3B + E32-C41 | E39-F3A-5 + E32-C31 (N) | E39-F3B + E32-C31 (N) | E39-F18 + E32-CC200 E32-C11N | E39-F3C + E32-C31 (N) | E32-L15 |

* Refer to page 20 for details.



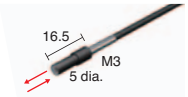
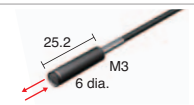
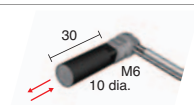
- Small-spot is ideal for detecting minute objects.
  Select the Fiber Unit that is best suited for the workpiece size and installation distance.
  (Refer to Reference Information for Model Selection)

## Specifications

### Reflective Fiber Units

#### Small-spot Models

#### Lens Units + Fiber Units

| Type | Spot diameter | Center distance (mm) | Lens Units | Lens Units + Fiber Units | Fiber Units | | 21 Page Dimensions No. |
|---|---|---|---|---|---|---|---|
| | | | Models | Appearance | Bending radius of cable | Models | |
| Short-distance, small-spot | 0.1 dia. | 7 | E39-F3A-5 |  | R25 | E32-C41 1M | 21-A |
| | 0.5 dia. | | |  | | E32-C31 2M | 21-B |
| | | | |  | Flexible, R4 | E32-C31N 2M | 21-C |
| Medium-distance, small-spot | 0.2 dia. | 17 | E39-F3B |  | R25 | E32-C41 1M | 21-D |
| | 0.5 dia. | | |  | | E32-C31 2M | 21-E |
| | | | |  | Flexible, R4 | E32-C31N 2M | 21-F |
| Long-distance, small-spot | 3 dia. | 50 | E39-F18 |  | R25 | E32-CC200 2M | 21-G |
| | | | |  | Flexible, R4 | E32-C11N 2M | 21-H |

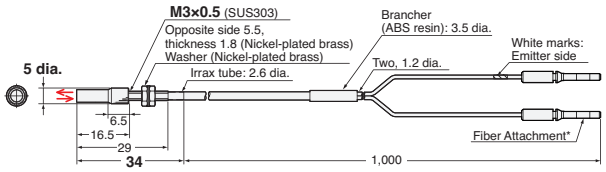
* The spot diameter and the center distance are same when using with E3X-HD series or E3X-SD series.

# Dimensions

Installation Information → 56 and 59 Page

## Reflective Fiber Units

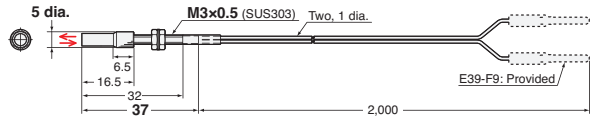
### 21-A E32-C41 1M (No Cutting) + E39-F3A-5




* Attached with adhesive and cannot be removed.

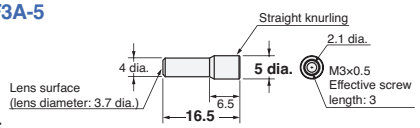
**Note:** There is a white tube on the emitter fiber.

### 21-B E32-C31 2M (Free Cutting) + E39-F3A-5




**Note:** There is a white line on the emitter fiber.

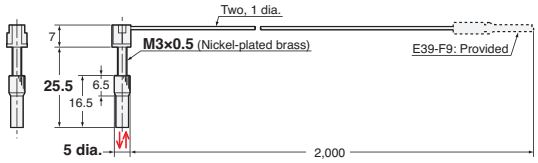
### E39-F3A-5




**Material:**
Aluminum for body and optical glass for lens

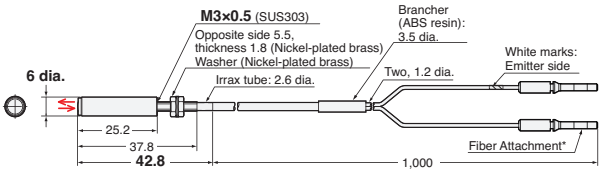
**Note:** This is a Lens Unit for the E32-C41, E32-C31 and E32-C31N.

### 21-C E32-C31N 2M (Free Cutting) + E39-F3A-5




**Note:** There is a white line on the emitter fiber.

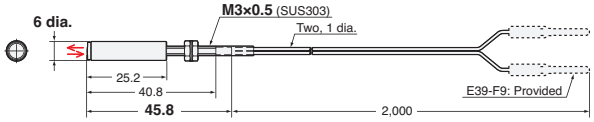
### 21-D E32-C41 1M (No Cutting) + E39-F3B




* Attached with adhesive and cannot be removed.

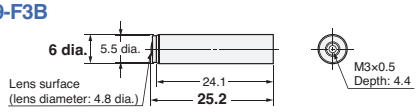
**Note:** There is a white tube on the emitter fiber.

### 21-E E32-C31 2M (Free Cutting) + E39-F3B




**Note:** There is a white line on the emitter fiber.

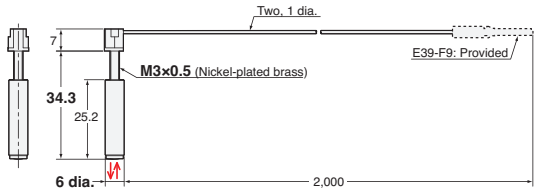
### E39-F3B




**Material:**
Aluminum for body and optical glass for lens

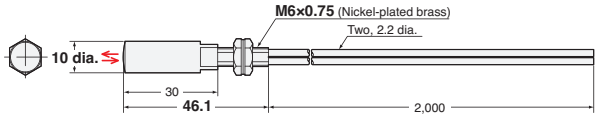
**Note:** This is a Lens Unit for the E32-C41, E32-C31 and E32-C31N.

### 21-F E32-C31N 2M (Free Cutting) + E39-F3B



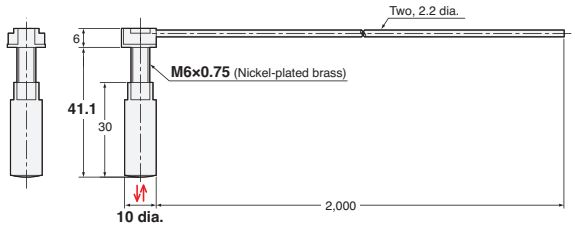

**Note:** There is a white line on the emitter fiber.

### 21-G E32-CC200 2M (Free Cutting) + E39-F18



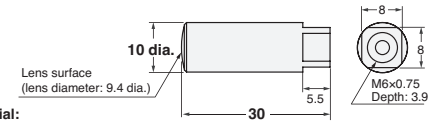

**Note:** There is a white line on the emitter fiber.

### 21-H E32-C11N 2M (Free Cutting) + E39-F18




**Note:** There is a white line on the emitter fiber.

### E39-F18




**Material:**
Aluminum for body and optical glass for lens

**Note:** This is a Lens Unit for the E32-C11N and E32-CC200.

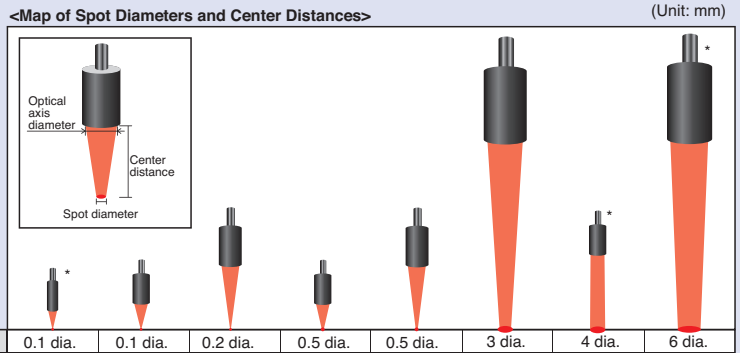
## - Reference Information for Model Selection -

### Model Selection Tips

Select the best model by following these steps.

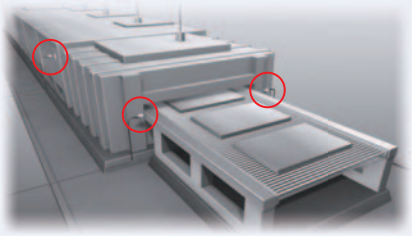
1. Select the model based on the spot diameter suitable for the workpiece size.
   * The Variable-spot Type is useful if there are different sensing object sizes.
2. Select the model based on the allowable installation distance and center distance.

<Map of Spot Diameters and Center Distances> (Unit: mm)




| Spot diameter | 0.1 dia. | 0.1 dia. | 0.2 dia. | 0.5 dia. | 0.5 dia. | 3 dia. | 4 dia. | 6 dia. |
|---|---|---|---|---|---|---|---|---|
| Center distance | 5 | 7 | 17 | 7 | 17 | 50 | 0 to 20 | 50 |
| Optical axis diameter | 2.4 | 3.7 | 4.8 | 3.7 | 4.8 | 9.4 | 3.7 | 10 |
| Models | E32-C42S | E39-F3A-5 + E32-C41 | E39-F3B + E32-C41 | E39-F3A-5 + E32-C31 (N) | E39-F3B + E32-C31 (N) | E39-F18 + E32-CC200 E32-C11N | E39-F3C + E32-C31 (N) | E32-L15 |

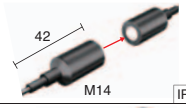
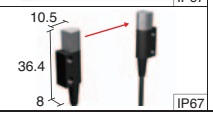
* Refer to page 18 for details.



- Maximum sensing distance without attaching a Lens: 20 m (E32-T17L)
  Suitable for detection of large objects and for use in large-scale installations.
- Powerful enough to resist the influences of dust and dirt.
- In addition to the products listed on this page, Lenses are available to extend the sensing distance. (→ 24 to 27 pages)

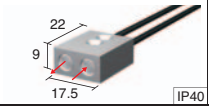
## Specifications

### Through-beam Fiber Units

| Sensing direction | Aperture angle | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 23 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Top-View | 10° |   | R25 | 20,000 *1 | 20,000 *1 / 20,000 *1 | ST :20,000*1 SHS: 8,000 | 10 dia. | E32-T17L 10M | 23-A |
| Side-View | 30° |   | | 3,600 | 4,000 *2 / 4,000 *2 | ST : 4,000*2 SHS: 1,800 | 4 dia. (0.1 dia.) | E32-T14 2M | 23-B |

*1 The optical fiber is 10 m long on each side, so the sensing distance is 20,000 mm.
*2 The optical fiber is 2 m long on each side, so the sensing distance is 4,000 mm.

### Reflective Fiber Units

| Sensing direction | Aperture angle | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Model | 23 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Top-View | 4° |   | Bend-resistant, R4 | 800 | 40 to 2,800 / 40 to 900 | ST : 40 to 1,400 SHS: 40 to 480 | – | E32-D16 2M | 23-C |

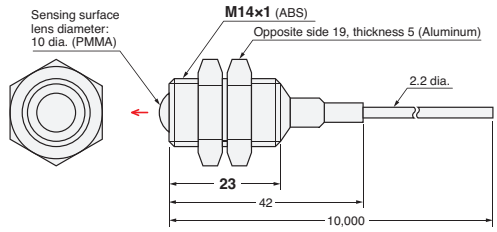
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

## Dimensions

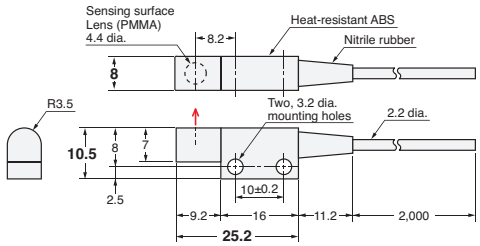
Installation Information → 58 Page

### Through-beam Fiber Units (Set of 2)

23-A E32-T17L 10M (Free Cutting)



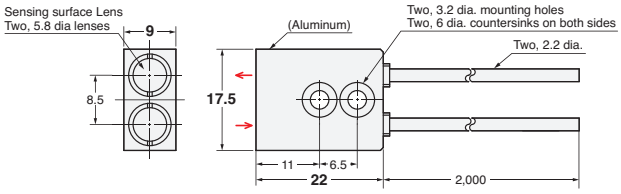

23-B E32-T14 2M (Free Cutting)




Installation Information → 56 Page

### Reflective Fiber Units

23-C E32-D16 2M (Free Cutting)

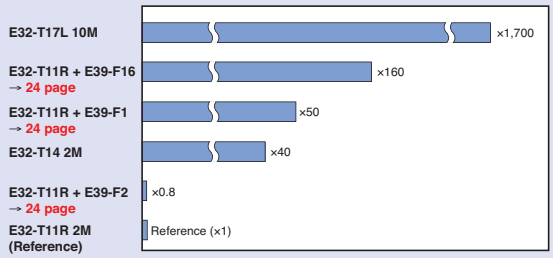



## - Reference Information for Model Selection -

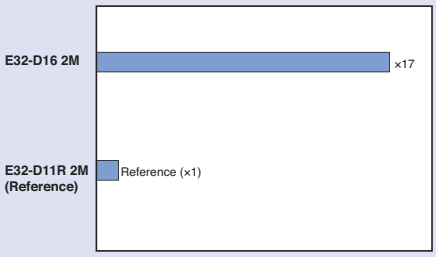
### Comparisons of incident level

Select the model based on the comparisons of incident level against Standard Fiber Units.

Comparisons of incident level (Through-beam)

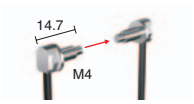
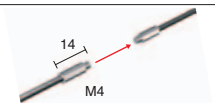
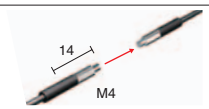



Comparisons of incident level (Reflective)



## Specifications

### Through-beam Fiber Units

| Lens Units / Fiber Units | Type | High-power (incident level: 50 times) | | | Ultra-high-power (incident level: 160 times) | | | Side-View (incident level: 0.8 times) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Models | E39-F1 | | | E39-F16 | | | E39-F2 | | |
| | Appearance |  24-A | | |  24-B | | |  24-C | | |
| | Aperture angle | Approx. 12° | | | Approx. 6° | | | Approx. 60° | | |
| | Optical axis diameter (minimum sensing object) | 4 dia. (0.1 dia.) | | | 7.2 dia. | | | 3 dia. (0.1 dia.) | | |
| Models | Appearance (mm) | Sensing distance (mm) | | | | | | | | |
| | | Simple Fiber Amplifier Units E3X-SD | Smart Fiber Amplifier Units E3X-HD | | Simple Fiber Amplifier Units E3X-SD | Smart Fiber Amplifier Units E3X-HD | | Simple Fiber Amplifier Units E3X-SD | Smart Fiber Amplifier Units E3X-HD | |
| | | | GIGA HS | Other modes | | GIGA HS | Other modes | | GIGA HS | Other modes |
| E32-T11N 2M |   | 3,700 | 4,000 * 4,000 * | ST : 4,000 * SHS: 2,000 25-A | 4,000 * | 4,000 * 4,000 * | ST : 4,000 * SHS: 3,600 25-D | — | — | — |
| E32-T11R 2M |   | 4,000 * | 4,000 * 4,000 * | ST : 4,000 * SHS: 2,000 25-B | 4,000 * | 4,000 * 4,000 * | ST : 4,000 * SHS: 3,600 25-E | 440 | 1,450 500 | ST : 800 SHS: 200 25-G |
| E32-T11 2M |   | 4,000 * | 4,000 * 4,000 * | ST : 4,000 * SHS: 1,860 25-C | 4,000 * | 4,000 * 4,000 * | ST : 4,000 * SHS: 4,000 * 25-F | 720 | 2,300 860 | ST : 1,320 SHS: 320 25-H |

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

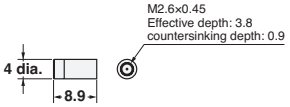
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.

## Dimensions

Installation Information → 59 Page

### Lens Units (Set of 2)

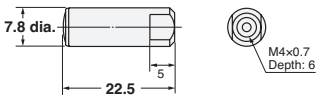
**24-A E39-F1**




**Material:** Brass for the body and optical glass for the lens itself.

**Note:** Two per set.

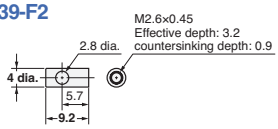
**24-B E39-F16**




**Material:** SUS303 for the body and optical glass for the lens itself.

**Note:** Two per set.

**24-C E39-F2**




**Material:** Brass for the body and optical glass for the lens itself.

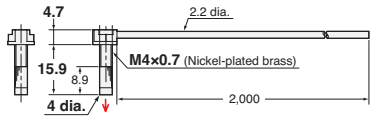
**Note:** Two per set.

## Dimensions

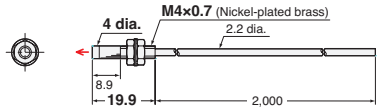
Installation Information → 58 and 59 Page

### Through-beam Fiber Units (Set of 2)

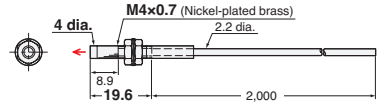
**25-A E32-T11N 2M (Free Cutting) + E39-F1**



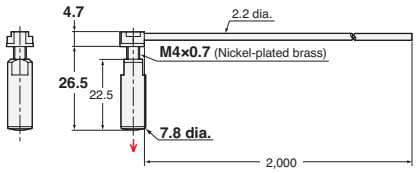

**25-B E32-T11R 2M (Free Cutting) + E39-F1**



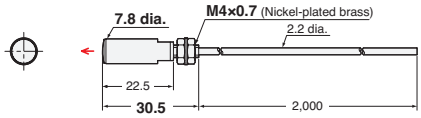

**25-C E32-T11 2M (Free Cutting) + E39-F1**



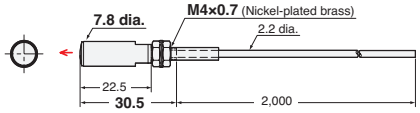

**25-D E32-T11N 2M (Free Cutting) + E39-F16**



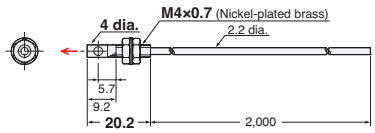

**25-E E32-T11R 2M (Free Cutting) + E39-F16**



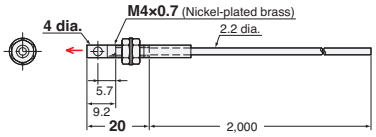

**25-F E32-T11 2M (Free Cutting) + E39-F16**




**25-G E32-T11R 2M (Free Cutting) + E39-F2**




**25-H E32-T11 2M (Free Cutting) + E39-F2**

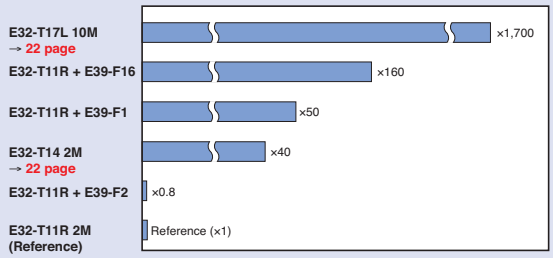



## - Reference Information for Model Selection -

### Comparisons of incident level

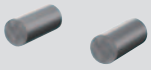
Select the model based on the comparisons of incident level against Standard Fiber Units.

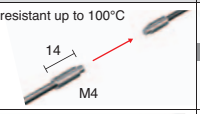
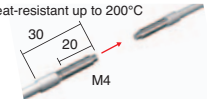
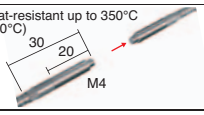
**Comparisons of incident level (Through-beam)**



## Specifications

### Through-beam Fiber Units

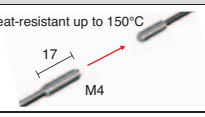
| Lens Units / Fiber Units | Type | High-power (incident level: 50 times) | Ultra-high-power (incident level: 160 times) | Side-View (incident level: 0.8 times) |
|---|---|---|---|---|
| | Models | E39-F1 | E39-F16 | E39-F2 |
| | Appearance |  26-A |  26-B |  26-C |
| | Aperture angle | Approx. 12° | Approx. 6° | Approx. 60° |
| | Optical axis diameter (minimum sensing object) | 4 dia. (0.1 dia.) | 7.2 dia. (0.1 dia.) | 3 dia. (0.1 dia.) |

| Models | Appearance (mm) | Sensing distance (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Simple Fiber Amplifier Units E3X-SD | Smart Fiber Amplifier Units E3X-HD | | Simple Fiber Amplifier Units E3X-SD | Smart Fiber Amplifier Units E3X-HD | | Simple Fiber Amplifier Units E3X-SD | Smart Fiber Amplifier Units E3X-HD | |
| | | | GIGA | HS / Other modes | | GIGA | HS / Other modes | | GIGA | HS / Other modes |
| E32-T51R 2M | Heat-resistant up to 100°C  | 2,000 | 4,000 * | 3,900 | 4,000 * | 4,000 * | 4,000 * | 360 | 1,400 | 500 |
| | | | | ST : 4,000 * SHS: 1,500 27-A | | | ST : 4,000 * SHS: 4,000 * 27-D | | | ST : 720 SHS: 200 27-G |
| E32-T81R-S 2M | Heat-resistant up to 200°C  | 1,800 | 4,000 * | 2,700 | 4,000 * | 4,000 * | 4,000 * | 280 | 1,000 | 360 |
| | | | | ST : 4,000 * SHS: 1,000 27-B | | | ST : 4,000 * SHS: 1,800 27-E | | | ST : 550 SHS: 140 27-H |
| E32-T61-S | Heat-resistant up to 350°C (200°C)  | 4,000 * | 4,000 * | 4,000 * | 4,000 * | 4,000 * | 4,000 * | 780 | 1,680 | 600 |
| | | | | ST : 4,000 * SHS: 1,800 27-C | | | ST : 4,000 * SHS: 3,100 27-F | | | ST : 900 SHS: 240 27-I |

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

**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**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 the optimum values.
**3.** The ambient temperature of E32-T61-S must be between –40 to 200°C when using it with E39-F1 or E39-F2 Lens Unit.
The ambient temperature of E32-T61-S must be between –40 to 350°C when using it with E39-F16 Lens Unit.

| Lens Units / Fiber Units | Type | High-power (incident level: 50 times) | Ultra-high-power (incident level: 160 times) |
|---|---|---|---|
| | Models | E39-F1-33 | E39-F16 |
| | Appearance |  26-D |  26-B |
| | Aperture angle | Approx. 12° | Approx. 6° |
| | Optical axis diameter (minimum sensing object) | 4 dia. (0.1 dia.) | 7.2 dia. (0.1 dia.) |

| Model | Appearance (mm) | Appearance (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Simple Fiber Amplifier Units E3X-SD | Smart Fiber Amplifier Units E3X-HD | | Simple Fiber Amplifier Units E3X-SD | Smart Fiber Amplifier Units E3X-HD | |
| | | | GIGA | HS / Other modes | | GIGA | HS / Other modes |
| E32-T51 2M | Heat-resistant up to 150°C  | 2,400 | 4,000 * | 2,300 | 4,000 * | 4,000 * | 4,000 * |
| | | | | ST : 4,000 * SHS: 1,400 27-J | | | ST : 4,000 * SHS: 4,000 * 27-K |

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

**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**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 the optimum values.

## Dimensions

Installation Information → 59 Page

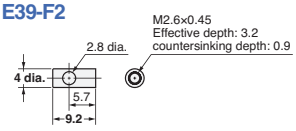
### Lens Units (Set of 2)

**26-A E39-F1**



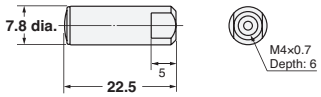

**Material:** Brass for the body and optical glass for the lens itself.
**Note:** Two per set.

**26-C E39-F2**



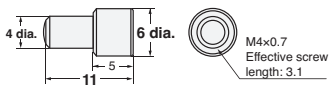

**Material:** Brass for the body and optical glass for the lens itself.
**Note:** Two per set.

**26-B E39-F16**




**Material:** SUS303 for the body and optical glass for the lens itself.
**Note:** Two per set.

**26-D E39-F1-33**



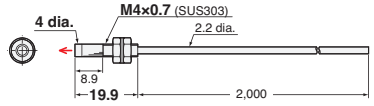

**Material:** Brass for the body and optical glass for the lens itself.
**Note 1:** Two per set.
**Note 2:** This is the Lens Unit for the E32-T51.

## Dimensions

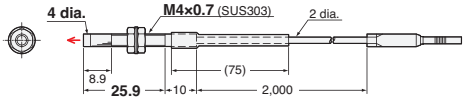
Installation Information → 58 and 59 Page

### Through-beam Fiber Units (Set of 2)

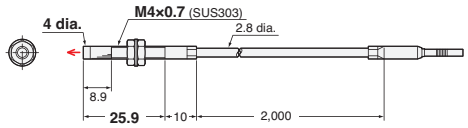
**27-A E32-T51R 2M (Free Cutting) + E39-F1**



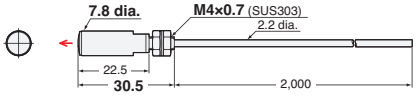

**27-B E32-T81R-S 2M (No Cutting) + E39-F1**



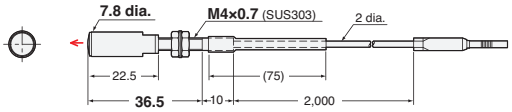

**27-C E32-T61-S 2M (No Cutting) + E39-F1**



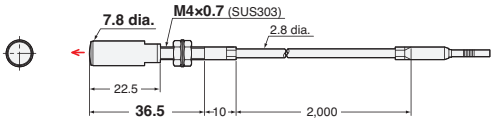

**27-D E32-T51R 2M (Free Cutting) + E39-F16**



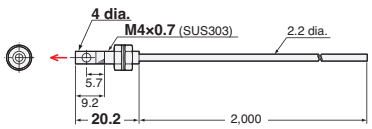

**27-E E32-T81R-S 2M (No Cutting) + E39-F16**



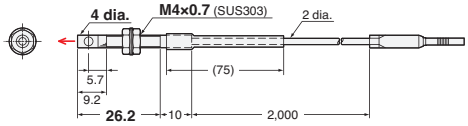

**27-F E32-T61-S 2M (No Cutting) + E39-F16**



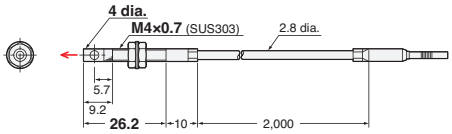

**27-G E32-T51R 2M (Free Cutting) + E39-F2**



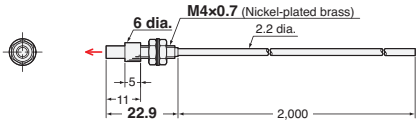

**27-H E32-T81R-S 2M (No Cutting) + E39-F2**



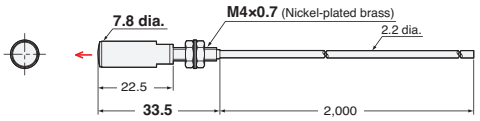

**27-I E32-T61-S 2M (No Cutting) + E39-F2**




**27-J E32-T51 2M (Free Cutting) + E39-F1-33**




**27-K E32-T51 2M (Free Cutting) + E39-F16**

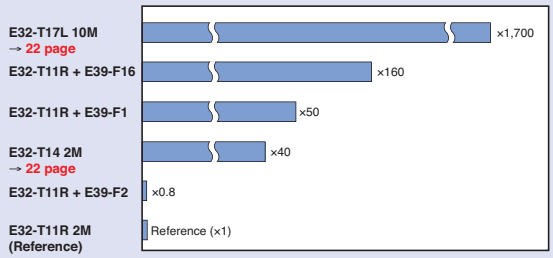


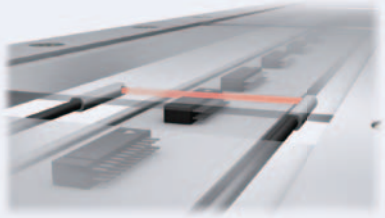

## - Reference Information for Model Selection -

### Comparisons of incident level

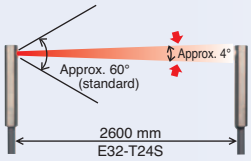
Select the model based on the comparisons of incident level against Standard Fiber Units.

**Comparisons of incident level (Through-beam)**



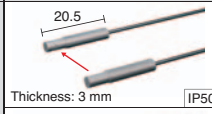
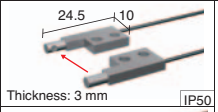
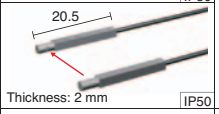
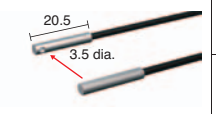
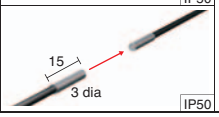


- The fine beam prevents false detection of light that is reflected off surrounding objects.




## Specifications

### Through-beam Fiber Units

| Sensing direction | Aperture angle | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 29 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Side-View | 1.5° |   | Flexible, R1 | 890 | 3,220<br>1,200 | ST : 1,780<br>SHS: 500 | 2 dia. (0.1 dia.) | E32-A03 2M | 29-A |
| | |   | R10 | | | | | E32-A03-1 2M | 29-B |
| | 3.4° |   | | 340 | 1,280<br>450 | ST : 680<br>SHS: 200 | 1.2 dia. (0.1 dia.) | E32-A04 2M | 29-C |
| | 4° |   | Flexible, R1 | 1,170 | 4,000 *<br>1,460 | ST : 2,200<br>SHS: 580 | 2 dia. (0.1 dia.) | E32-T24SR 2M NEW | 29-D |
| | | | R10 | 1,400 | 4,000 *<br>1,740 | ST : 2,600<br>SHS: 700 | | E32-T24S 2M | 29-E |
| Top-View | |   | | 2,000 | 4,000 *<br>2,500 | ST : 3,800<br>SHS: 1,000 | 1.7 dia. (0.1 dia.) | E32-T22S 2M | 29-F |

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

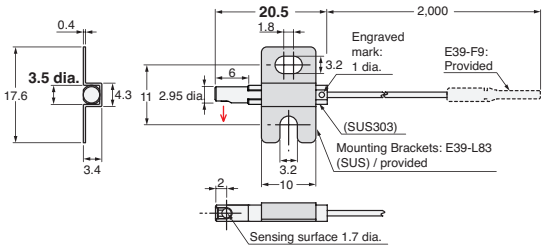
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.

## Dimensions

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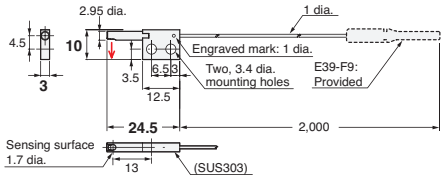
### Through-beam Fiber Units (Set of 2)

#### 29-A E32-A03 2M (Free Cutting)



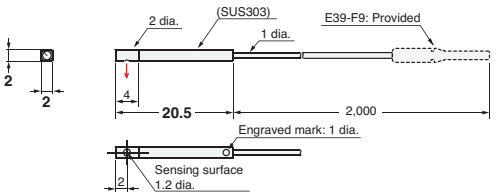

**Note:** Use the engraved surface and its opposing surface as installation (reference) surfaces.

#### 29-B E32-A03-1 2M (Free Cutting)



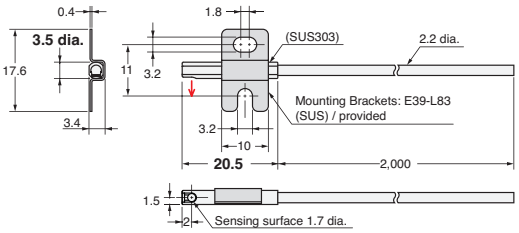

**Note 1:** Use the engraved surface and its opposing surface as installation (reference) surfaces.
**Note 2:** Set of two symmetrically shaped Fiber Units.

#### 29-C E32-A04 2M (Free Cutting)

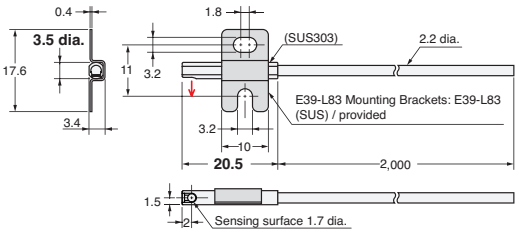



**Note:** Use the engraved surface and its opposing surface as installation (reference) surfaces.

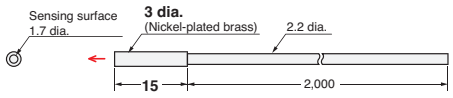
#### 29-D E32-T24SR 2M (Free Cutting)




#### 29-E E32-T24S 2M (Free Cutting)



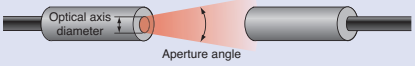

#### 29-F E32-T22S 2M (Free Cutting)

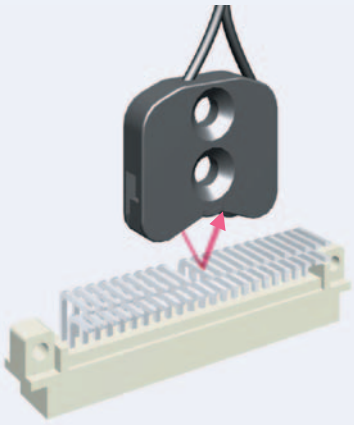



## - Reference Information for Model Selection -

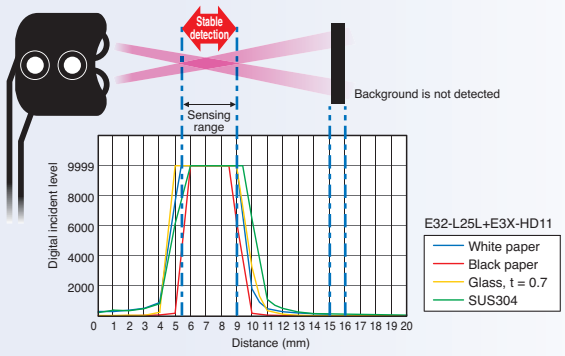
### Aperture angle and Optical Axis Diameter

The Aperture angle is the output angle of the emitted beam, and the optical axis diameter is the core diameter of the emitter fiber.
A fiber with a narrow view has a larger optical axis diameter than standard fibers, but the aperture angle is smaller so it is not influenced by surrounding objects.



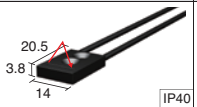
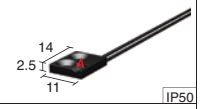
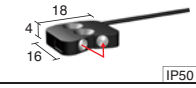


- These Fiber Units detect only objects in the sensing range. Objects in the background that are located beyond a certain point are not detected. They are not easily affected by the material or color of the sensing object.




## Specifications

## Reflective Fiber Units

| Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Standard sensing object (minimum sensing object) | Models | 31 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA HS | Other modes | | | |
| Flat-View |   | R25 | 0 to 15 | 0 to 15<br>0 to 15 | ST : 0 to 15<br>SHS: 0 to 12 | Soda glass with reflection factor of 7% | E32-L16-N 2M | 31-A |
| |   | R10 | 0 to 4 | 0 to 4<br>0 to 4 | ST : 0 to 4<br>SHS: 0 to 4 | (5 µm dia.) | E32-L24S 2M | 31-B |
| Side-View |   | | 5.4 to 9 (Cente: 7.2) | 5.4 to 9<br>5.4 to 9 (Center altogether: 7.2) | ST : 5.4 to 9<br>SHS: 5.4 to 9 (Center altogether: 7.2) | | E32-L25L 2M | 31-C |

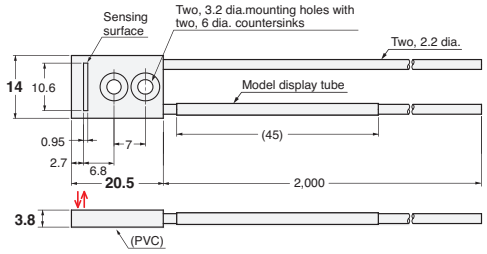
**Note 1.** If operation is affected by the background, perform power tuning or use the ECO Mode to decrease the incident light level.
**2.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**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 the optimum values.
**4.** The sensing distances for Reflective Fiber Units are for white paper.

## Dimensions

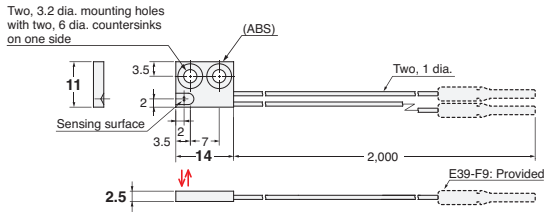
Installation Information → 57 Page

# Reflective Fiber Units

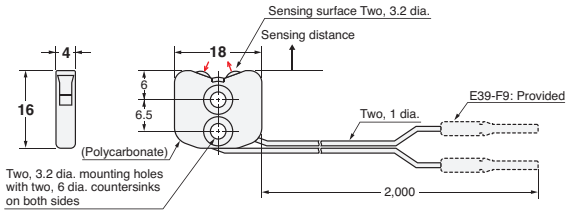
### 31-A E32-L16-N 2M (Free Cutting)




### 31-B E32-L24S 2M (Free Cutting)



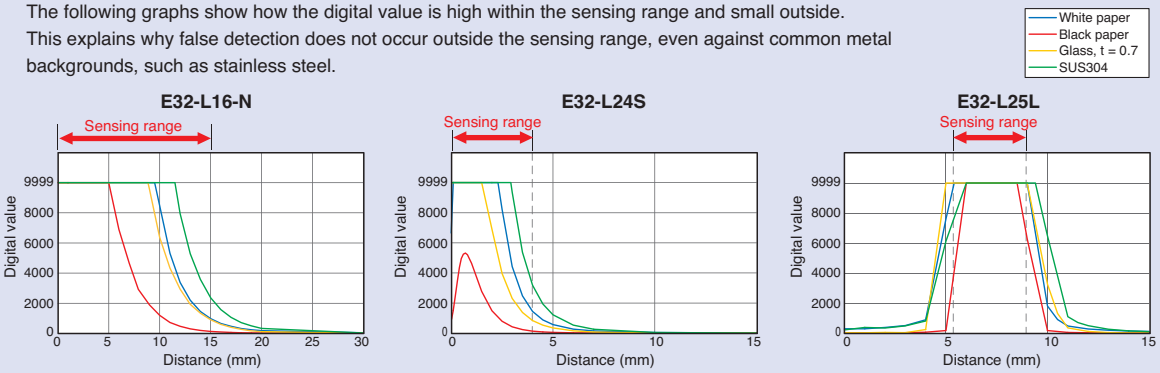

### 31-C E32-L25L 2M (Free Cutting)



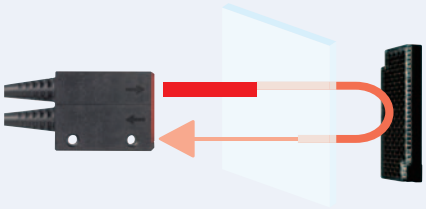

## - Reference Information for Model Selection -

### Sensing Distance vs. Digital Value

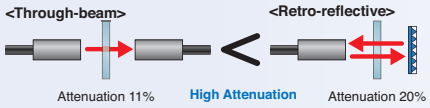
The following graphs show how the digital value is high within the sensing range and small outside. This explains why false detection does not occur outside the sensing range, even against common metal backgrounds, such as stainless steel.



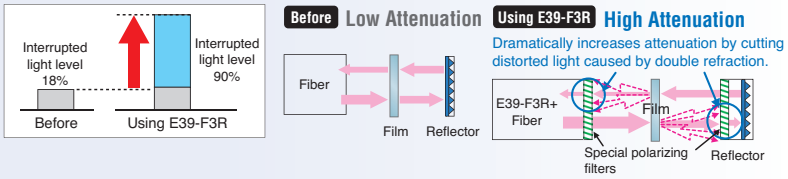

* E3X-HD11 used in High-speed (HS) Mode.



- Retro-reflective Fiber Units are ideal for detecting transparent objects.
  The light beam passes through the object twice, this model interrupts light more than Through-beam model.

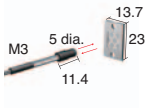
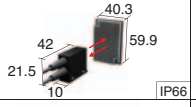
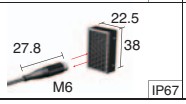



- Excellent detection performance with transparent films.
  (E32-C31 2M + E39-F3R)
  The specially designed filter eliminates undesirable light, which allows significantly more light to be interrupted for stable detection of films.




## Specifications

### Retro-reflective Fiber Units

| Type | | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 33 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| Features | Size | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD GIGA HS | Smart Fiber Amplifier Units (Advanced Models) E3X-HD Other modes | | | |
| Film detection * | M3 |   | R25 | 220 | 250<br>200 | ST : 250<br>– | – | E32-C31 2M + E39-F3R + E39-RP37 | 33-A |
| Square | – |   | | 1,500 | 150 to 1,500<br>150 to 1,500 | ST : 150 to 1,500<br>SHS:150 to 1,500 | (0.2dia.) | E32-R16 5M | 33-B |
| Threaded Models | M6 |   | R10 | 10 to 250 | 10 to 250<br>10 to 250 | ST : 10 to 250<br>SHS:10 to 250 | (0.1dia.) | E32-R21 2M | 33-C |

* This effect may not be as strong for some films. Detection may be unstable if the object is placed directly in front of the Lens Unit. Check suitability beforehand.

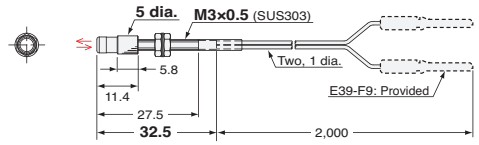
**Note 1.** Objects with a high reflection factor may cause the Fiber Sensor to detect reflected light as incident light.
**2.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**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 the optimum values.

## Dimensions

Installation Information → 56, 58 and 59 Page

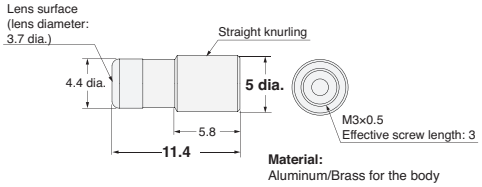
## Retro-reflective Fiber Units

### 33-A E32-C31 2M (Free Cutting) + E39-F3R



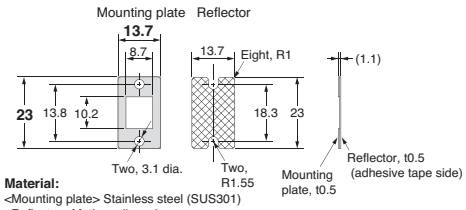

**Note:** There is a white line on the emitter fiber.

### E39-F3R




**Material:**
Aluminum/Brass for the body

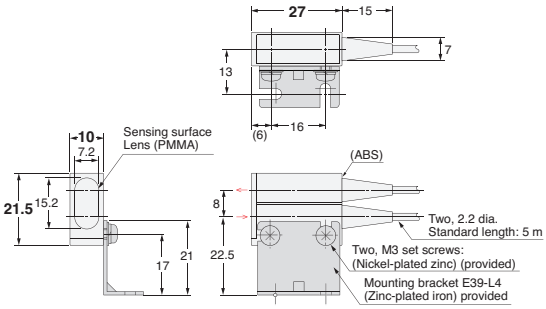
### E39-RP37



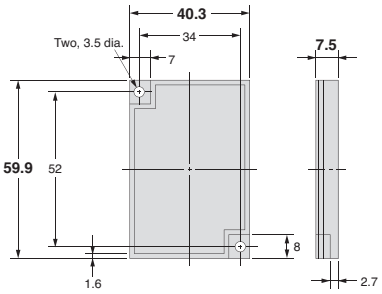

**Material:**
<Mounting plate> Stainless steel (SUS301)
<Reflector> Methacrylic resin

**Note:** Set includes one Reflector and one Mounting Plate.

### 33-B E32-R16 5M (Free Cutting)

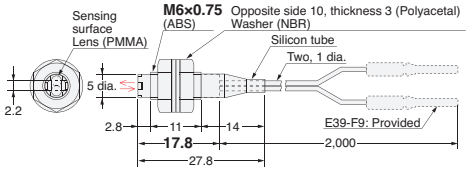



### E39-R1 (Provided)

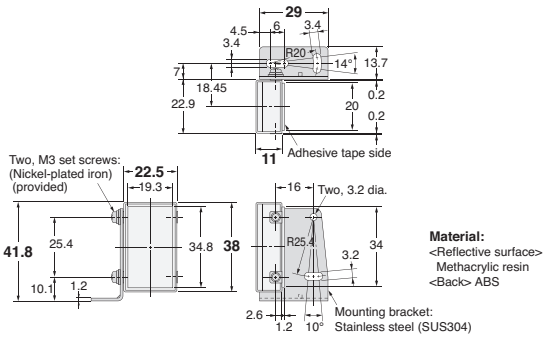



**Material:**
<Reflective surface>
Methacrylic resin
<Back> ABS

### 33-C E32-R21 2M (Free Cutting)




### E39-R3 (Provided)




**Material:**
<Reflective surface>
Methacrylic resin
<Back> ABS

## - Reference Information for Model Selection -

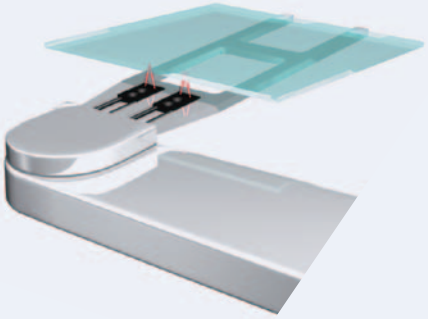
### Performance Comparison of Transparent Object Detection

For detecting transparent objects, consider using following products together: E32-C31, E39-F3R and E39-RP37.

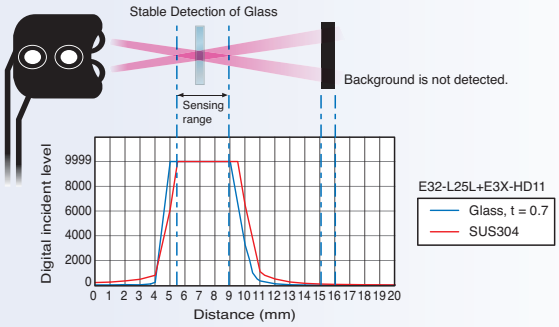
- This configuration features a special built-in optical filter that ensures stable detection of double-refractive materials, such as films and PET bottles.
- The retro-reflective model is suitable for detecting glass.

We also offer two models with an integrated lens for detecting glass to prevent lens loss.

| Sensing object / Models | Film wrapper on cigarette packs | PET bottles | Glass bottles | Plate glass, t: 0.7 |
|---|---|---|---|---|
| E32-C31 2M + E39-F3R + E39-RP37 | ◎ | ◎ | ○ | ○ |
| E32-R16 5M | △ | △ | ○ | ○ |
| E32-R21 2M | △ | △ | ○ | ○ |

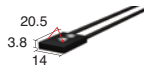
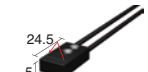
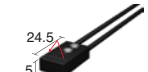


- These Fiber Units are based on a limited-reflective optical system where the emitting light and receiving light axes intersect at the same angle. This allows for stable detection of glass because the Fiber Units receives the specular reflection of the glass when the glass is in the sensing range.




## Specifications

### Limited-reflective Fiber Units

| Type | | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Standard sensing object (minimum sensing object) | Models | 35 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| Features | Detection direction | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD GIGA / HS | Smart Fiber Amplifier Units (Advanced Models) E3X-HD Other modes | | | |
| Small size | Flat-View |  IP50 | R10 | 0 to 4 | 0 to 4<br>0 to 4 | ST : 0 to 4<br>SHS: 0 to 4 | (5 μm dia.) | E32-L24S 2M | 35-A |
| Standard | |  IP40 | R25 | 0 to 15 | 0 to 15<br>0 to 15 | ST : 0 to 15<br>SHS: 0 to 12 | Soda glass with reflection factor of 7% | E32-L16-N 2M | 35-B |
| Glass-substrate alignment, 70°C | |  IP40 | | 10 to 20 | 10 to 20<br>10 to 20 | ST : 10 to 20<br>SHS: — | | E32-A08 2M * | 35-C |
| Standard long distance | |  IP40 | | 12 to 30 | 12 to 30<br>12 to 30 | ST : 12 to 30<br>SHS: — | | E32-A12 2M | 35-D |
| Side View form | Side-View |  IP50 | R10 | 5.4 to 9 (Center 7.2) | 5.4 to 9 (Center 7.2)<br>5.4 to 9 (Center 7.2) | ST : 5.4 to 9 (Center 7.2)<br>SHS: 5.4 to 9 (Center 7.2) | (5 μm dia.) | E32-L25L 2M | 35-E |
| Glass-substrate Mapping, 70°C | Top-View |  IP40 | R25 | 15 to 38 (Center 25) | 15 to 38 (Center 25)<br>15 to 38 (Center 25) | ST : 15 to 38 (Center 25)<br>SHS: — | End surface of soda glass with reflection factor of 7% (t = 0.7 mm, rounded edges) | E32-A09 2M | 35-F |

* If the background influences the sensing accuracy, perform power tuning or use the ECO Mode to decrease the incident light level.

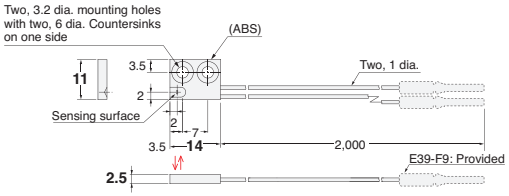
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

## Dimensions

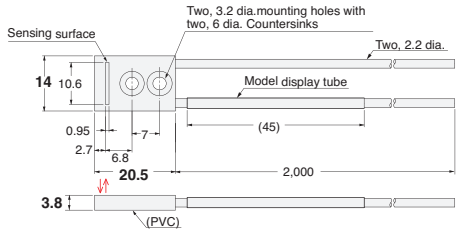
Installation Information → 56 and 57 Page

## Limited-reflective Fiber Units

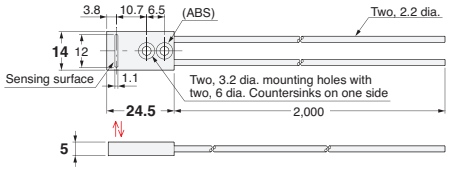
### 35-A E32-L24S 2M (Free Cutting)



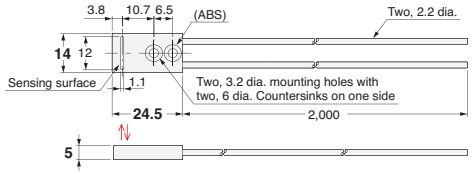

### 35-B E32-L16-N 2M (Free Cutting)



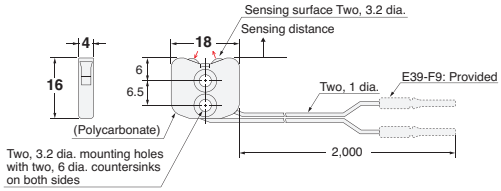

### 35-C E32-A08 2M (Free Cutting)



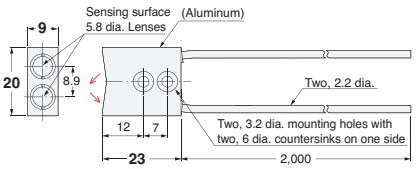

### 35-D E32-A12 2M (Free Cutting)




### 35-E E32-L25L 2M (Free Cutting)



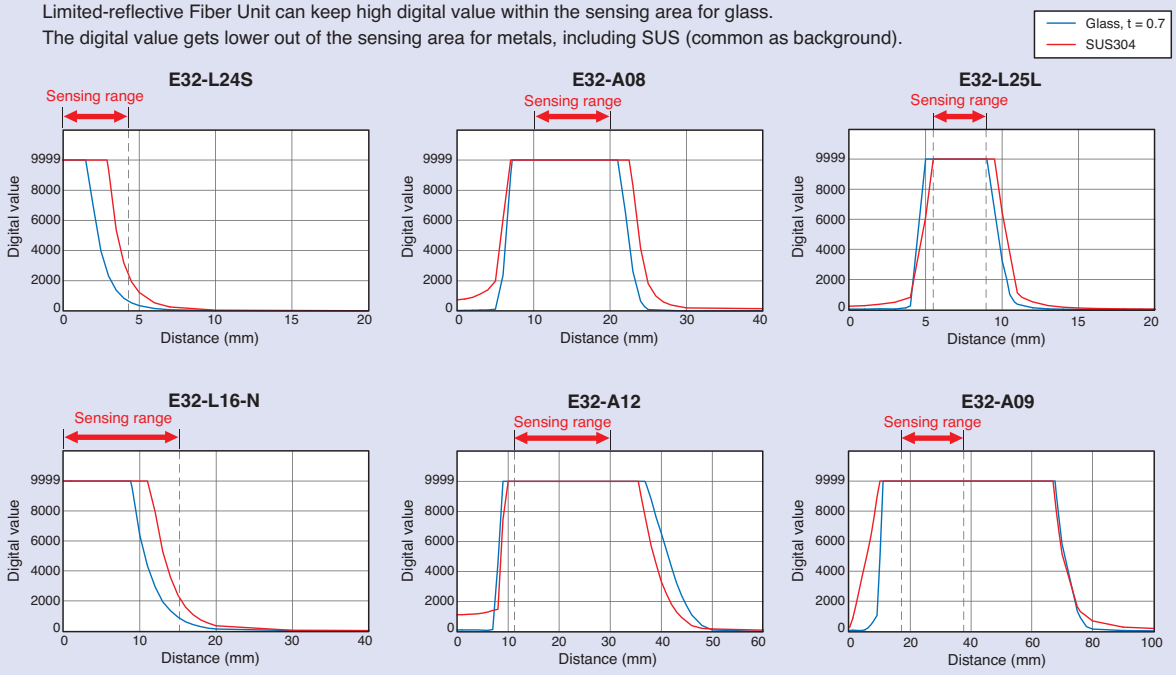

### 35-F E32-A09 2M (Free Cutting)



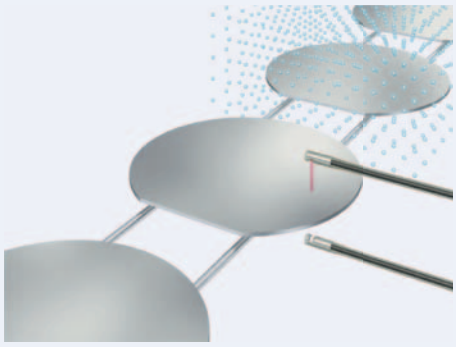

## - Reference Information for Model Selection -

### Sensing Distance vs. Digital Value

Limited-reflective Fiber Unit can keep high digital value within the sensing area for glass.
The digital value gets lower out of the sensing area for metals, including SUS (common as background).




* E3X-HD11 used in High-speed (HS) Mode.



• These Fiber Units are made from fluororesin for resistance to chemicals.

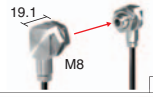
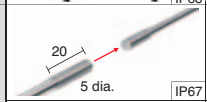
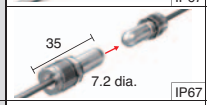
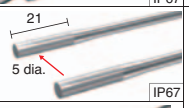
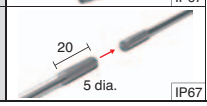
**Chemical-resistant Data for Fluororesin (Reference)**

| Material / Chemical | Fluororesin | Acryl | ABS | Polycarbonate | Polyethylene | PVC |
|---|---|---|---|---|---|---|
| Hydrochloric acid | ◎ | △ | △ | △ | △ | × |
| Sulfuric acid | ◎ | × | × | × | × | × |
| Sodium hydroxide | ◎ | △ | △ | × | ○ | × |
| Methyl alcohol | ◎ | × | △ | × | ○ | × |
| Acetone | ◎ | × | × | × | △ | × |
| Toluene | ◎ | △ | × | × | △ | × |
| Benzene | ◎ | △ | △ | × | △ | × |

**Note:** Results depend on concentration.

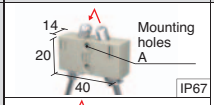
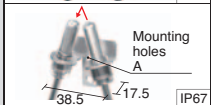
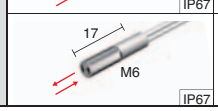
## Specifications

### Through-beam Fiber Units

| Type | Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 37 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Oil-resistant | Right-angle |   | Flexible, R1 | 4,000 *1 | 4,000 *1<br>4,000 *1 | ST : 4,000 *1<br>SHS: 2,200 | 4 dia. (0.1 dia.) | E32-T11NF 2M NEW | 37-A |
| Chemical/ oil resistant | Top-view |   | R40 | 3,200 | 4,000 *1<br>4,000 *1 | ST : 4,000 *1<br>SHS: 1,600 | | E32-T12F 2M | 37-B |
| | |   | R4 | 2,100 | 4,000 *1<br>2,600 | ST : 4,000 *1<br>SHS: 1,000 | | E32-T11F 2M | 37-C |
| | Side-view |   | R40 | 400 | 1,400<br>500 | ST : 800<br>SHS: 200 | 3 dia. (0.1 dia.) | E32-T14F 2M | 37-D |
| Chemical/ oil resistant 150°C *2 | Top-view |   | | 1,400 | 4,000 *1<br>1,800 | ST : 2,800<br>SHS: 700 | 4 dia. (0.1 dia.) | E32-T51F 2M | 37-E |

*1 The optical fiber is 2 m long on each side, so the sensing distance is 4,000 mm.
*2 For continuous operation, use the Fiber Unit between –40 and 130°C.

### Reflective Fiber Units

| Type | Sensing direction | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Standard sensing object (minimum sensing object) | Models | 37 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Semiconductors: Cleaning, developing, and etching, 60°C | Top-view |   | R40 | 8 to 20 mm from tip of Lens (Recommended sensing distance: 11 mm)<br>19 to 31 mm from center of mounting hole A (Recommended sensing distance: 22 mm) | | | Glass (t=0.7 mm) | E32-L11FP 5M | 37-F |
| Semiconductors: Resist stripping, 85°C | |   | | 8 to 20 mm from tip of Lens (Recommended sensing distance: 11 mm)<br>32 to 44 mm from center of mounting hole A (Recommended sensing distance: 35 mm) | | | | E32-L11FS 5M | 37-G |
| Chemical/oil resistant | |   | | 100 | GIGA –<br>130 | ST : 190<br>SHS: 60 | (5 µm dia.) | E32-D12F 2M | 37-H |
| Only cable: chemical resistant | |   | R4 | 180 | 840<br>240 | ST : 350<br>SHS: 100 | | E32-D11U 2M | 37-I |

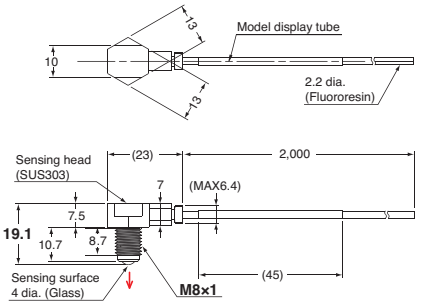
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

## Dimensions

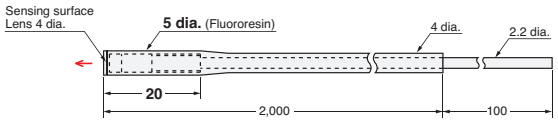
Installation Information → 58 Page

### Through-beam Fiber Units (Set of 2)

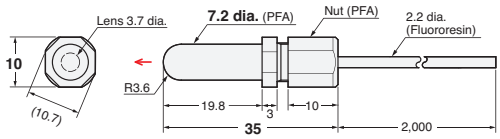
**37-A E32-T11NF 2M (Free Cutting)**



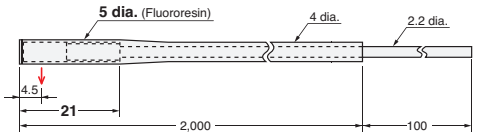

**37-B E32-T12F 2M (Free Cutting)**



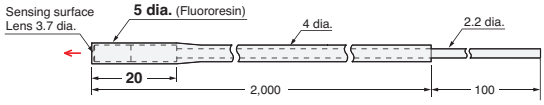

**37-C E32-T11F 2M (Free Cutting)**




**37-D E32-T14F 2M (Free Cutting)**



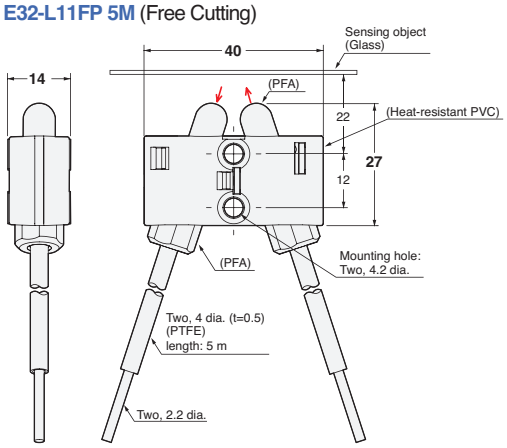

**37-E E32-T51F 2M (Free Cutting)**



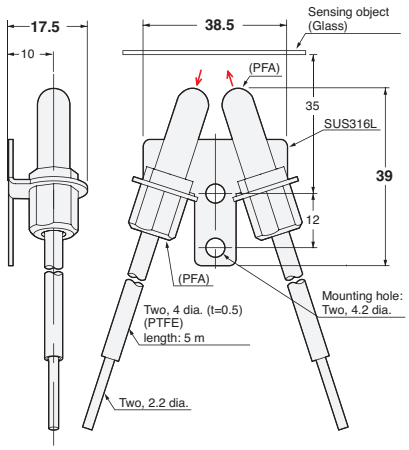

Installation Information → 56 and 57 Page

### Reflective Fiber Units

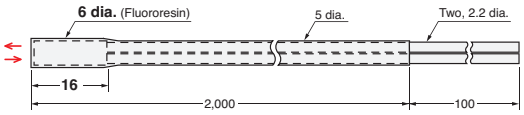
**37-F E32-L11FP 5M (Free Cutting)**



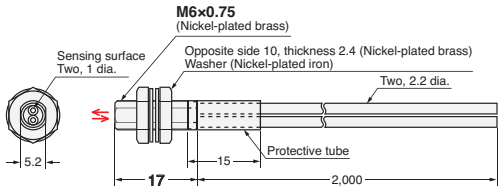

**37-G E32-L11FS 5M (Free Cutting)**




**37-H E32-D12F 2M (Free Cutting)**



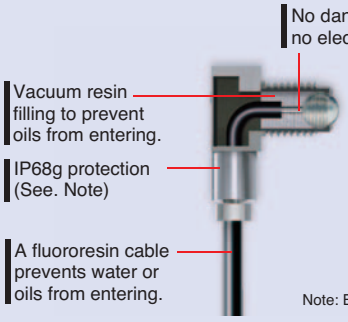

**37-I E32-D11U 2M (Free Cutting)**



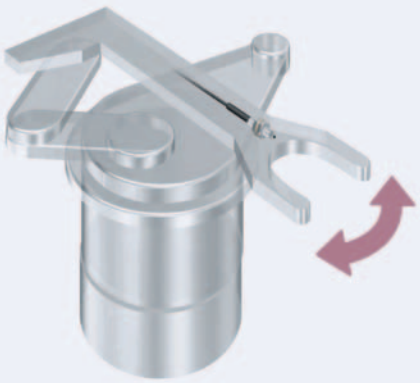

## - Reference Information for Model Selection -

### Oil-resistance performance of the E32-T11NF

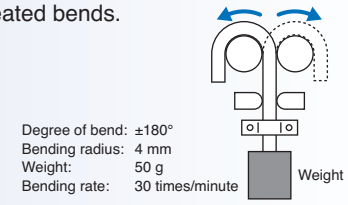
This diagram explains why the new E32-T11NF is oil resistant.



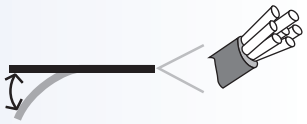

Note: Equivalent to IP68g of JIS C0920 Annex 1.



- Capable of withstanding one million repeated bends.



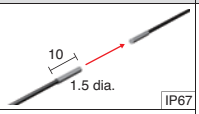
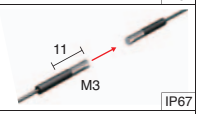
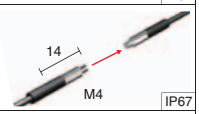
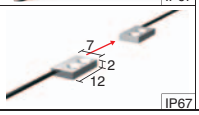

- A large number of independent fine fibers ensures good flexibility. Suitable for use on moving parts without easily breaking.



- Protective Stainless Spiral Tube is available for covering the fiber cable to protect it from accidental breaking due to snagging or shock.

## Specifications

### Through-beam Fiber Units

| Size | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 39 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA HS | Other modes | | | |
| 1.5 dia. |   | Bend-resistant, R4 | 200 | 680<br>220 | ST : 400<br>SHS: 90 | 0.5 dia. (5 μm dia.) | E32-T22B 2M | 39-A |
| M3 |   | | | | | | E32-T21 2M | 39-B |
| M4 |   | | 720 | 2,500<br>900 | ST : 1,350<br>SHS: 360 | 1 dia. (5 μm dia.) | E32-T11 2M | 39-C |
| Square |   | | 150 | 500<br>170 | ST : 300<br>SHS: 70 | 0.5 dia. (5 μm dia.) | E32-T25XB 2M | 39-D |

**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**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 the optimum values.

## Protective Stainless Spiral Tube (Sold separately)

Insert the fiber cable into the protective tube to prevent breaking by snagging or shock.

| Applicable Fiber Units | Model | Quantity | 39 Page Dimensions No. |
|---|---|---|---|
| E32-T11R 2M/E32-T11 2M/ E32-T51R 2M/E32-T51 2M | E39-F32C | 2 pieces | 39-E |

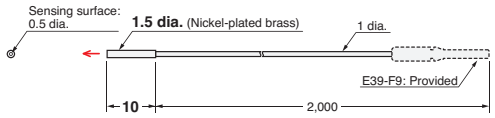
* This Tube cannot be used if a Lens Unit is being used.

## Dimensions

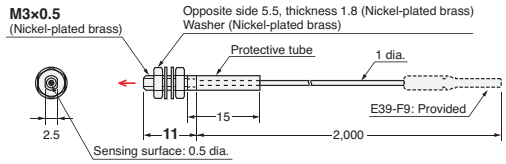
Installation Information → 58 and 59 Page

### Through-beam Fiber Units (Set of 2)

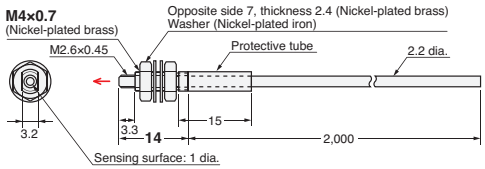
#### 39-A E32-T22B 2M (Free Cutting)



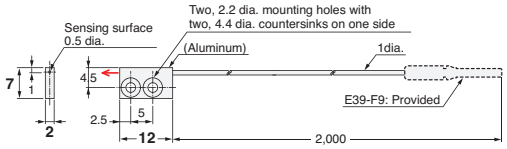

#### 39-B E32-T21 2M (Free Cutting)




#### 39-C E32-T11 2M (Free Cutting)

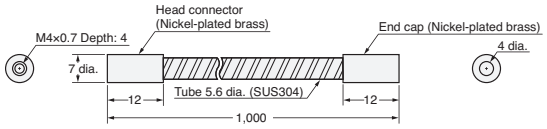


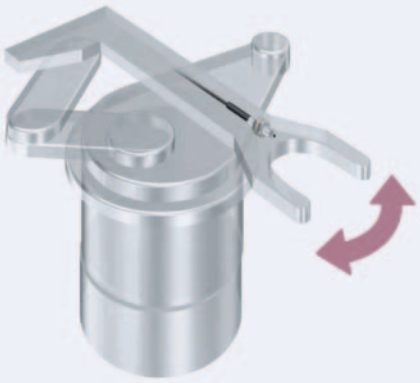

#### 39-D E32-T25XB 2M (Free Cutting)



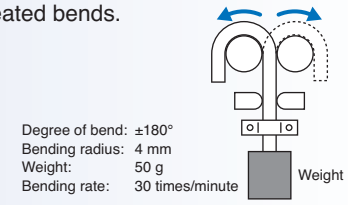

**Note 1:** Set of two symmetrically shaped Fiber Units.
**Note 2:** Four, M2 × 8 stainless steel countersunk mounting screws are provided.

#### 39-E E39-F32C

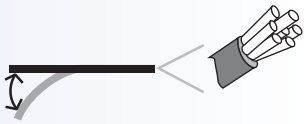




- Capable of withstanding one million repeated bends.



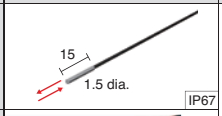
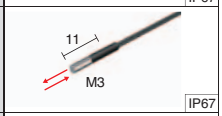
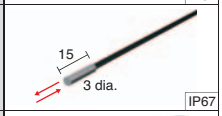
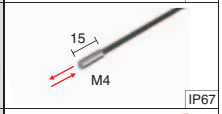
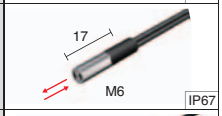
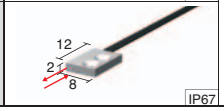

- A large number of independent fine fibers ensures good flexibility. Suitable for use on moving parts without easily breaking.



- Protective Stainless Spiral Tube is available for covering the fiber cable to protect it from accidental breaking due to snagging or shock.

## Specifications

### Reflective Fiber Units

| Size | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 41 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA HS | Other modes | | | |
| 1.5 dia. |   | Bend-resistant, R4 | 30 | 140 / 40 | ST : 60 SHS: 16 | (5 µm dia.) | E32-D22B 2M | 41-A |
| M3 |   | | | | | | E32-D21 2M | 41-B |
| 3 dia. |   | | 70 | 300 / 90 | ST : 140 SHS: 40 | | E32-D221B 2M | 41-C |
| M4 |   | | | | | | E32-D21B 2M | 41-D |
| M6 |   | | 180 | 840 / 240 | ST : 350 SHS: 100 | | E32-D11 2M | 41-E |
| Square |   | | 50 | 240 / 60 | ST : 100 SHS: 30 | | E32-D25XB 2M | 41-F |

**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**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 the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

## Protective Stainless Spiral Tube (Sold separately)

Insert the fiber cable into the protective tube to prevent breaking by snagging or shock.

| Applicable Fiber Units | Models | Quantity | 41 Page Dimensions No. |
|---|---|---|---|
| E32-D21R 2M/E32-C31 2M/ E32-D21 2M | E39-F32A | 1 piece | 41-G |
| E32-D211R 2M/E32-D21B 2M | E39-F32C | 2 pieces | |
| E32-D11R 2M/E32-CC200 2M/ E32-D11 2M/E32-D51R 2M/ E32-D51 2M | E39-F32D | 1 piece | |

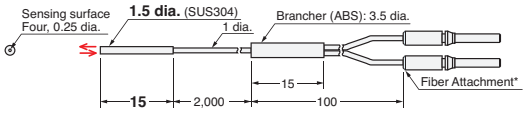
* This Tube cannot be used if a Lens Unit is being used.

## Dimensions

Installation Information → 56, 57 and 59 Page

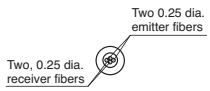
## Reflective Fiber Units

### 41-A E32-D22B 2M (No Cutting)

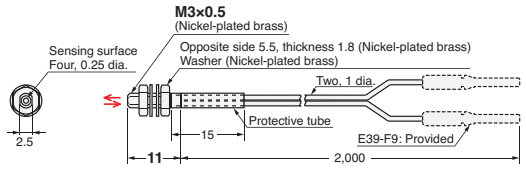



* Attached with adhesive and cannot be removed.

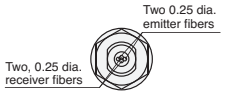
**Enlarged View of Sensing Surface**



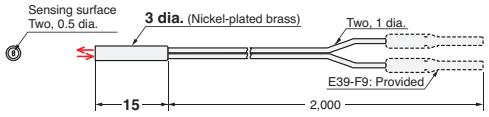

### 41-B E32-D21 2M (Free Cutting)



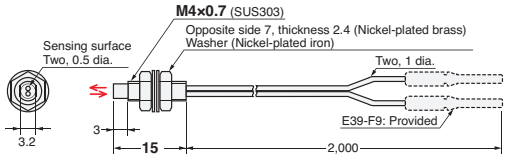

**Enlarged View of Sensing Surface**



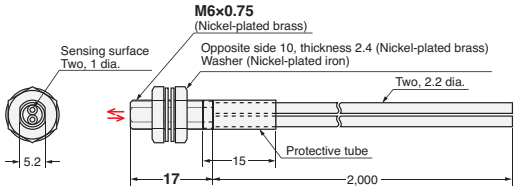

### 41-C E32-D221B 2M (Free Cutting)



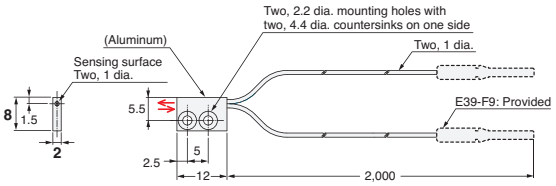

### 41-D E32-D21B 2M (Free Cutting)




### 41-E E32-D11 2M (Free Cutting)

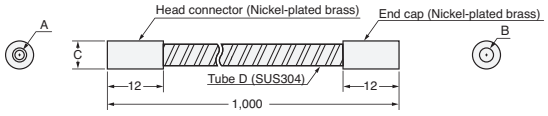



### 41-F E32-D25XB 2M (Free Cutting)

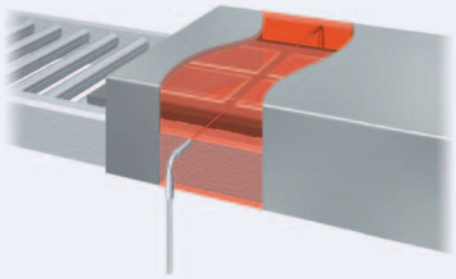



**Note:** Two, M2×8 stainless steel countersunk mounting screws are provided.

### 41-G E39-F32A/E39-F32C/E39-F32D



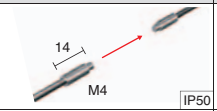
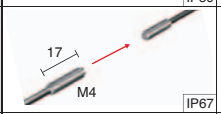
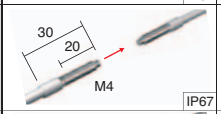
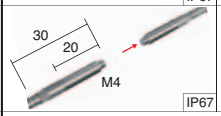

| Models | A | B | C | D |
|---|---|---|---|---|
| E39-F32A | M3×0.5 Depth: 4 | 3 dia. | 6 dia. | (4.6 dia.) |
| E39-F32C | M4×0.7 Depth: 4 | 4 dia. | 7 dia. | (5.6 dia.) |
| E39-F32D | M6×0.75 Depth: 4 | 5 dia. | 8.5 dia. | (7 dia.) |



- Wide product variety for temperatures from 100 to 350°C. Select the model according to heat-resistant temperature.

## Specifications

### Through-beam Fiber Units

| Heat-resistant temperature | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 43 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA HS | Other modes | | | |
| 100°C *1 |   | Flexible, R2 | 400 | 1,600 / 560 | ST : 800 SHS: 225 | 1 dia. (0.1 dia.) | E32-T51R 2M | 43-A |
| 150°C *2 |   | R35 | 800 | 2,800 / 1,000 | ST : 1,500 SHS: 400 | 1.5 dia. (0.1 dia.) | E32-T51 2M | 43-B |
| 200°C *3 |   | R10 | 360 | 1,000 / 360 | ST : 550 SHS: 140 | 0.7 dia. (5 µm dia.) | E32-T81R-S 2M | 43-C |
| 350°C *4 |   | R25 | 600 | 1,680 / 600 | ST : 900 SHS: 240 | 1 dia. (5 µm dia.) | E32-T61-S 2M | 43-D |
| 70°C | — | | | | | | Standard Fiber Units can be used. | – |

*1 For continuous operation, use the Fiber Unit between –40 to 90°C.
*2 For continuous operation, use the Fiber Unit between –40 to 130°C.
*3 The heat-resistant rating is not the same for all parts of the Fiber Unit. Refer to the dimensions diagrams for details.
*4 The ambient operating temperature for the E32-T61-S 2M is –60 to 350°C.

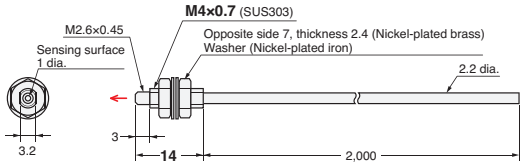
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.

## Dimensions

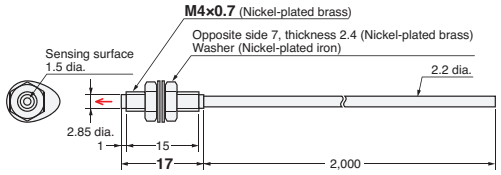
Installation Information → 58 and 59 Page

### Through-beam Fiber Units (Set of 2)

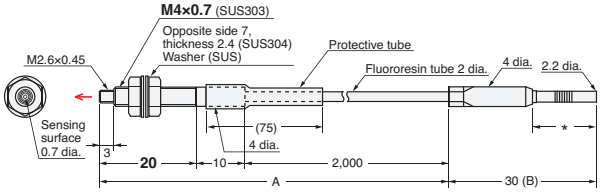
#### 43-A E32-T51R 2M (Free Cutting)




#### 43-B E32-T51 2M (Free Cutting)

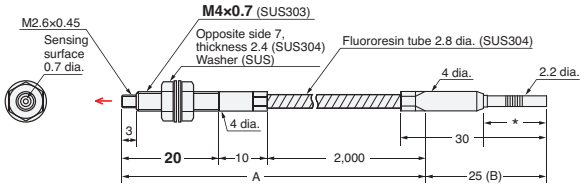



#### 43-C E32-T81R-S 2M (No Cutting)




**Note:** The maximum allowable temperatures for sections A and B are 200°C and 110°C, respectively. The section inserted into the Amplifier Unit (indicated by *) must be maintained within the Amplifier Unit's operating temperature range.

#### 43-D E32-T61-S 2M (No Cutting)




**Note:** The maximum allowable temperatures for sections A and B are 350°C and 110°C, respectively. The section inserted into the Amplifier Unit (indicated by *) must be maintained within the Amplifier Unit's operating temperature range.

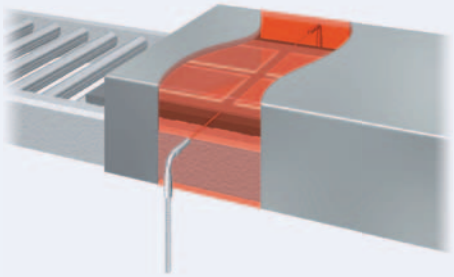
### - Reference Information for Model Selection -

**And**

**Long-distance Sensing Applications**

A separate Lens Unit can be attached to extend the sensing distance.

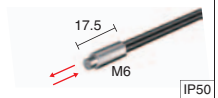
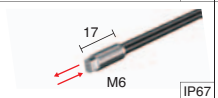
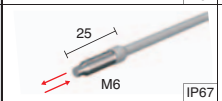
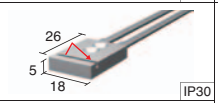
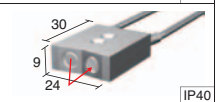
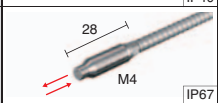
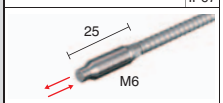
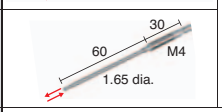
→ 26 page



- Wide product variety for temperatures from 100 to 400°C. Select the model according to heat-resistant temperature.

## Specifications

### Reflective Fiber Units

| Heat-resistant temperature | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Standard sensing object (minimum sensing object) | Models | 45 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | GIGA HS | Other modes | | | |
| 100°C *1 |   | Flexible, R2 | 140 | 670 / 190 | ST : 280 SHS: 80 | (5 μm dia.) | E32-D51R 2M | 45-A |
| 150°C *2 |   | R35 | 240 | 1,120 / 320 | ST : 450 SHS: 144 | | E32-D51 2M | 45-B |
| 200°C *3 |   | R10 | — | 420 / 120 | ST : 180 SHS: 54 | | E32-D81R-S 2M | 45-C |
| 300°C |   | R25 | 10 to 20 | 10 to 20 / 10 to 20 | ST : 10 to 20 SHS: – | Soda glass with reflection factor of 7% | E32-A08H2 3M | 45-D |
| |   | | 20 to 30 | 20 to 30 / 20 to 30 | ST : 20 to 30 SHS: – | End surface of soda glass with eflection factor of 7% (t = 0.7 mm, rounded edges) | E32-A09H2 2M | 45-E |
| 350°C *3 |   | | — | 420 / 120 | ST : 180 SHS: 54 | | E32-D611-S 2M NEW | 45-F |
| |   | | — | 420 / 120 | ST : 180 SHS: 54 | (5 μm dia.) | E32-D61-S 2M | 45-G |
| 400°C *3 |   | | — | 280 / 80 | ST : 120 SHS: 36 | | E32-D73-S 2M | 45-H |
| 70°C | — | | | | | | Standard Fiber Units can be used. | – |

*1 For continuous operation, use the Fiber Unit between –40 to 90°C.
*2 For continuous operation, use the Fiber Unit between –40 to 130°C.
*3 The heat-resistant rating is not the same for all parts of the Fiber Unit. Refer to the dimensions diagrams for details.

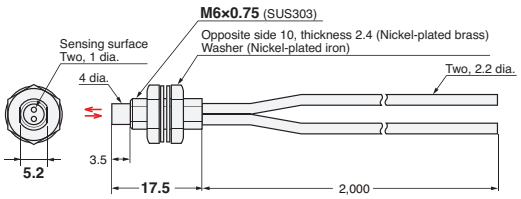
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.
**3.** The sensing distances for Reflective Fiber Units are for white paper.

## Dimensions

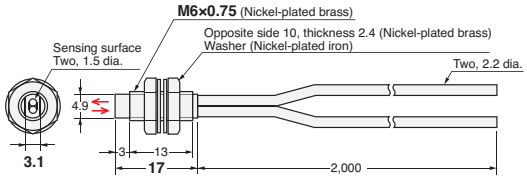
Installation Information → 56 and 57 Page

## Reflective Fiber Units

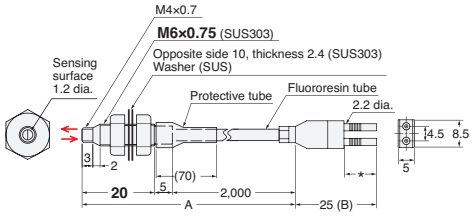
### 45-A E32-D51R 2M (Free Cutting)




### 45-B E32-D51 2M (Free Cutting)

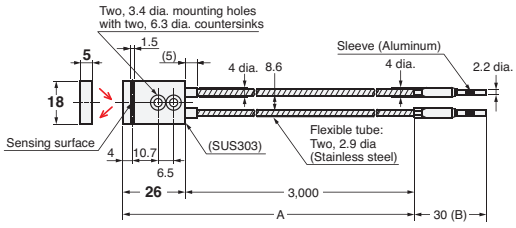



### 45-C E32-D81R-S 2M (No Cutting)

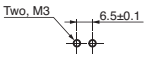



**Note:** The maximum allowable temperatures for sections A and B are 200°C and 110°C, respectively. The section inserted into the Amplifier Unit (indicated by *) must be maintained within the Amplifier Unit's operating temperature range.

### 45-D E32-A08H2 3M (No Cutting)

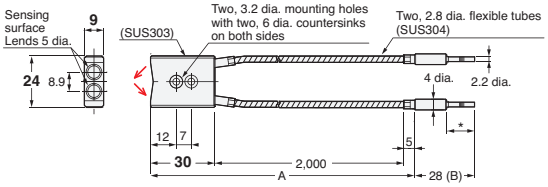



**Note:** The maximum allowable temperatures for sections A and B are 300°C and 110°C, respectively.



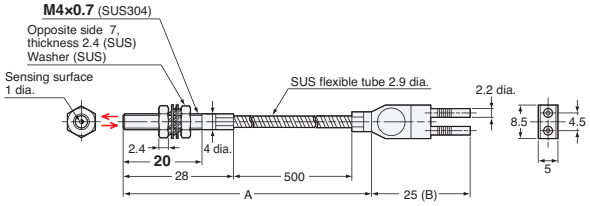

**Mounting holes**

### 45-E E32-A09H2 2M (No Cutting)



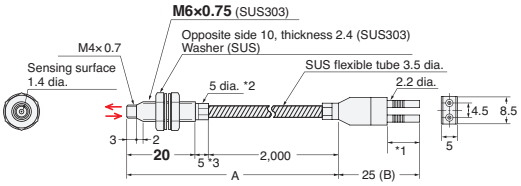

**Note:** The maximum allowable temperatures for sections A and B are 300°C and 110°C, respectively. The section inserted into the Amplifier Unit (indicated by *) must be maintained within the Amplifier Unit's operating temperature range.

### 45-F E32-D611-S 2M (No Cutting)




**Note:** The maximum allowable temperatures for sections A and B are 300°C and 110°C, respectively.

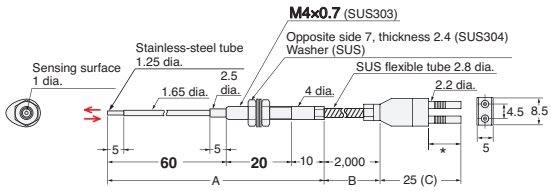
### 45-G E32-D61-S 2M (No Cutting)




*2. The diameter is 6 dia. if the fiber length exceeds 10 m.
*3. The length is 10 if the fiber length exceeds 10 m.

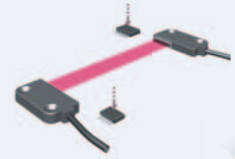
**Note:** The maximum allowable temperatures for sections A and B are 350°C and 110°C, respectively. The section inserted into the Amplifier Unit (indicated by *1) must be maintained within the Amplifier Unit's operating temperature range.

### 45-H E32-D73-S 2M (No Cutting)

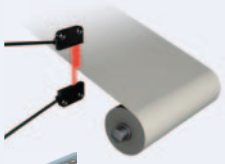


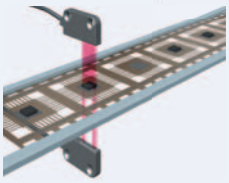

**Note:** The maximum allowable temperatures for sections A, B, and C are 400°C, 300°C, and 110°C, respectively.
The section inserted into the Amplifier Unit (indicated by *) must be maintained within the Amplifier Unit's operating temperature range.

Detection of falling workpieces



Meander detection

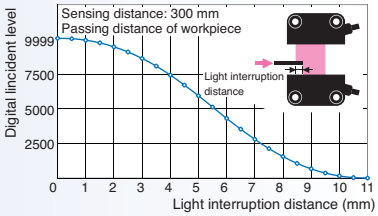




Detection of workpieces with holes

- Area beams are optimum for detecting workpieces presented in inconsistent positions, such as falling workpieces, or for meander detection, or for detecting workpieces with holes.
- This Fiber Unit is ideal for meander detectin because it outputs the digital value in a linear relation to the interrupted light distance.

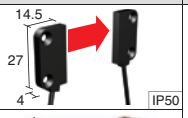
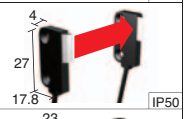
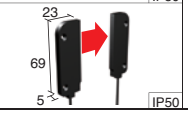
**Characteristics of Light Interruption (Typical)**




E32-T16PR+E3X-HD11

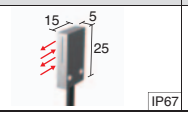
## Specifications

### Through-beam Fiber Units

| Type | Sensing width | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 47 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Area | 11 mm |   | Flexible, R1 | 800 | 3,100 / 1,120 | ST : 1,700 SHS: 440 | (0.2 dia.) *2 | E32-T16PR 2M | 47-A |
| | |   | | 700 | 2,750 / 960 | ST : 1,500 SHS: 380 | | E32-T16JR 2M | 47-B |
| | 30 mm |   | | 1,380 | 4,000 *1 / 1,700 | ST : 2,600 SHS: 680 | (0.3 dia.) *2 | E32-T16WR 2M | 47-C |

*1 The optical fiber is 2 m long on each side, so the sensing distance is 4,000 mm.
*2 The values for the minimum sensing object were obtained for detection in the sensing area with the sensing distance set to 300 mm. (The values are for a stationary sensing object.)

### Reflective Fiber Units

| Type | Sensing width | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 47 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Array | 11 mm |   | Bend-resistant, R4 | 150 | 700 / 200 | ST : 300 SHS: 90 | (5 µm dia.) | E32-D36P1 2M | 47-D |

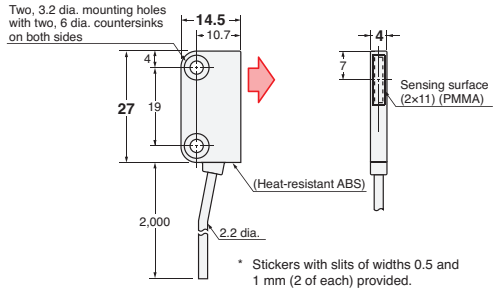
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.

## Dimensions

Installation Information → 58 Page

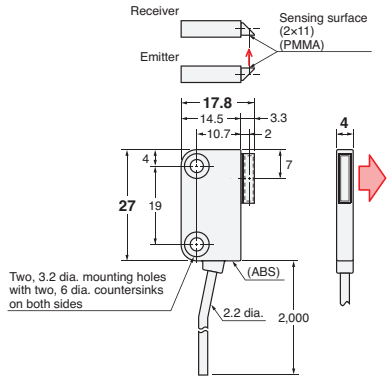
### Through-beam Fiber Units (Set of 2)

**47-A E32-T16PR 2M (Free Cutting)**

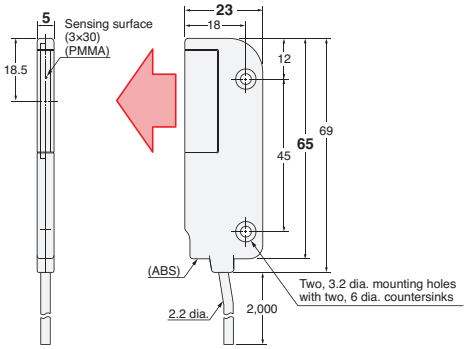



* Stickers with slits of widths 0.5 and 1 mm (2 of each) provided.

**47-B E32-T16JR 2M (Free Cutting)**



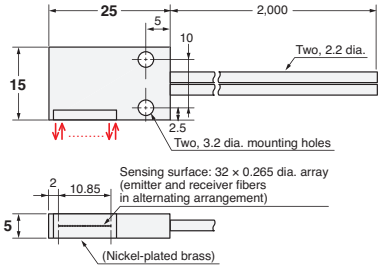

**47-C E32-T16WR 2M (Free Cutting)**

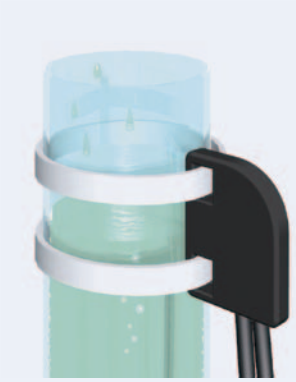



Installation Information → 57 Page

### Reflective Fiber Units

**47-D E32-D36P1 2M (Free Cutting)**





- Fiber Units for detecting liquid levels are available in two types: for tube mounting and liquid contact.

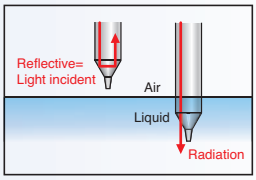
▶ **Tube-mounting Types**

Detect the liquid level inside transparent tubes.
Strap the Fiber Unit to a tube with band.

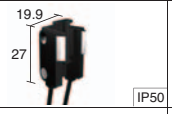
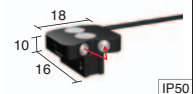
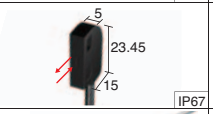
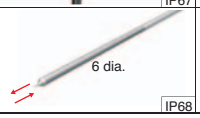


▶ **Liquid-contact Type**

Detect the liquid level by direct contact with the liquid.
This model has excellent chemical-resistance because the Fiber Unit is covered in fluororesin.



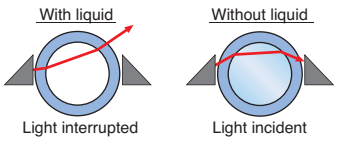
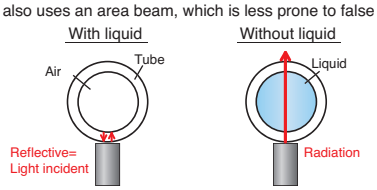

## Specifications

| Detection scheme | Tube diameter | Features | Appearance (mm) | Bending radius of cable | Applicable range | Optical axis diameter (minimum sensing object) | Models | 49 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|
| Tube-mounting | 3.2, 6.4 and 9.5 dia. | • Resistant to bubbles and droplets<br>• Residual quantity detection |  | Bend-resistant, R4 | Applicable tube: Transparent tube with a diameter of 3.2, 6.4, or 9.5 dia. and a recommended wall thickness of 1 mm | – | E32-A01 5M | 49-A |
| | 8 to 10 dia. | Ideal for mounting at multilevels |  | R10 | Applicable tube: Transparent tube with a diameter of 8 to 10 dia. and a recommended wall thickness of 1 mm | – | E32-L25T 2M | 49-B |
| | No restrictions | • Usable on large diameter tubes<br>• Resistant to bubbles and droplets |  | R4 | Applicable tube: Transparent tube (no restrictions on diameter) | – | E32-D36T 5M | 49-C |
| Liquid contact (heat-resistant up to 200°C) | – | – |  | R40 R25 *3 | Liquid-contact Type *1 | – | E32-D82F1 4M | 49-D |

*1 If the incident light level is too high, perform power tuning or use the ECO Mode to decrease the incident level.
*2 The applicable range is the same whether an E3X-HD series or E3X-SD series is used.
When using an E3X-HD Fiber Amplifier Unit in GIGA Power Mode, level detection may not work depending on the tube diameter. Make sure to confirm operation with the actual tube.
*3 The bending radius of the sensing section (except for the unbendable section) is 40 mm, and the bending radius of the fiber is 25 mm.

## - Reference Information for Model Selection -

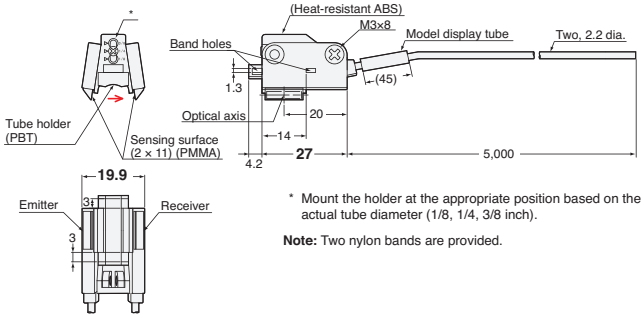
### Determining the Best Model for Tube-mounted Types

| Mounting and conditions | Recommended Unit | Features |
|---|---|---|
| When bubbles and the water droplets are generated | E32-A01 | This is a Through-beam Model, so the incident light will differ greatly between with and without of liquid.<br>It also uses an area beam, which is less prone to false detection by bubbles and droplets.<br>  |
| Multilevel installation in limited space | E32-L25T | This model is suitable for mounting at multilevels because of the thin type (height: 10 mm). |
| Mounting on large diameter tubes | E32-D36T | This model has no restrictions on the tube diameter, so it can be mounted on many different tube sizes.<br>It also uses an area beam, which is less prone to false detection by bubbles and droplets.<br>  |

## Dimensions

Installation Information → 56 and 57 Page

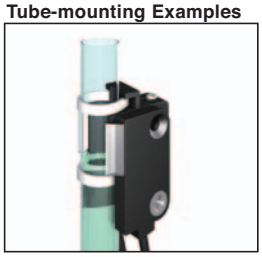
### 49-A E32-A01 5M (Free Cutting)



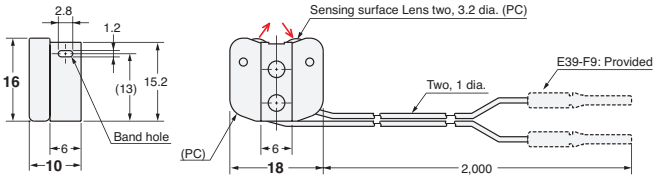

* Mount the holder at the appropriate position based on the actual tube diameter (1/8, 1/4, 3/8 inch).

**Note:** Two nylon bands are provided.

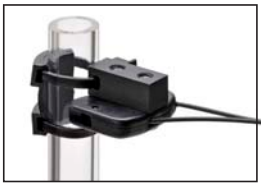
**Tube-mounting Examples**



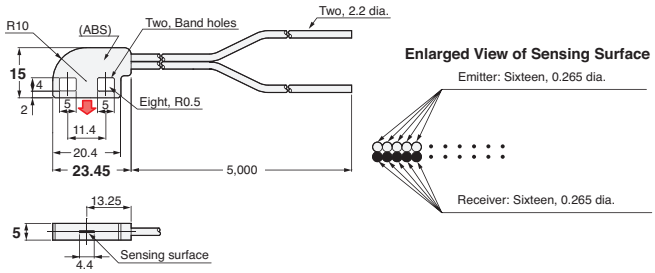
### 49-B E32-L25T 2M (Free Cutting)




**Note:** Two nylon bands and one anti-reflector are provided.

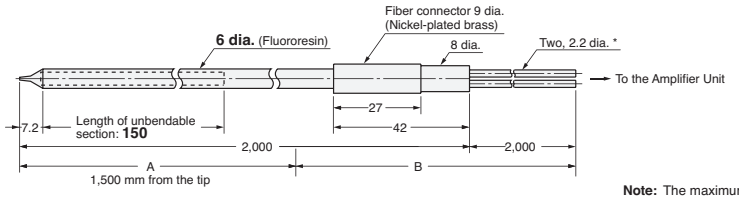


### 49-C E32-D36T 5M (Free Cutting)






### 49-D E32-D82F1 4M (Free Cutting)




* The 2-m section of optical fiber on the Amplifier unit side is plastic and therefore allows free cutting.

**Note:** The maximum allowable temperature is 200°C for section A and 85°C for section B.

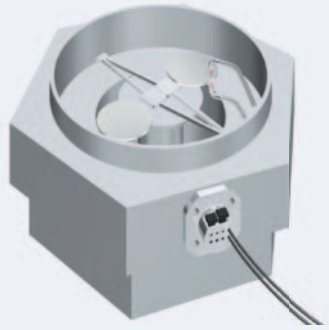
**And**

### Designed for Safe Residual quantity detection (E32-A01 only)

The E32-A01 Fiber Unit is designed to default to the same output as for liquid absent in the event of a failure, such as when the fiber breaks. This makes it suitable for residual quantity detection.

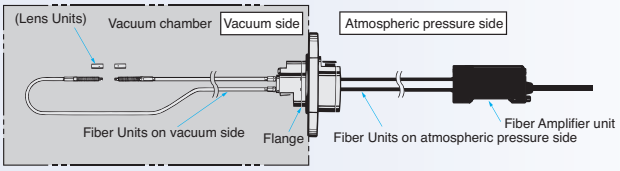
| | |
|---|---|
| Trouble (disconnection) | Light interrupted |
| With liquid | Light interrupted |
| Without liquid | Light incident |

If the failure goes unnoticed, this failsafe design will prevent false detection of liquid when there is no liquid present.



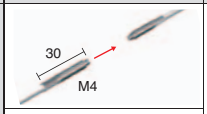
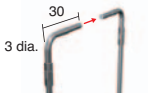
- Can be used under high vacuums of up to $10^{-5}$ Pa.
- Available in models with heat resistant up to 120 or 200°C.

**Configuration Example for using under vacuum**




## Specifications

### Through-beam Fiber Units

| Type | Heat-resistant temperature | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 51 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Vacuum side | 120°C |   | R30 | 200 | 720<br>260 | ST : 400<br>SHS: 100 | 1.2 dia. (10 µm dia.) | E32-T51V 1M | 51-A |
| | |   | | 1,200 | 3,780<br>1,360 | ST : 2,000<br>SHS: 520 | 4 dia. (0.1 dia.) | E32-T51V 1M + E39-F1V | 51-B |
| | 200°C |   | R25 | 500 | 1,760<br>640 | ST : 950<br>SHS: 260 | 2 dia. (0.1 dia.) | E32-T84SV 1M | 51-C |
| Atmospheric pressure side | 70°C |  | | — | — | ST : –<br>SHS: – | — | E32-T10V 2M | 51-D |

**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 µs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 µs, PNP output: 55 µs)
**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 the optimum values.

## Flange

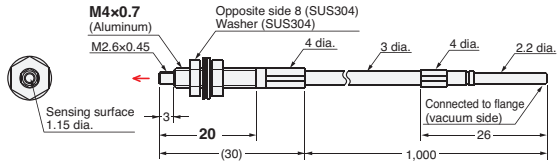
| Appearance | Type | Models | 51 Page Dimensions No. |
|---|---|---|---|
|  | 4-channel flange | E32-VF4 | 51-E |
|  | 1-channel flange | E32-VF1 | 51-F |

## Dimensions

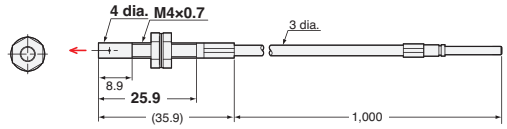
Installation Information → 58 and 59 Page

### Through-beam Fiber Units (Set of 2)

**51-A E32-T51V 1M (No Cutting)**



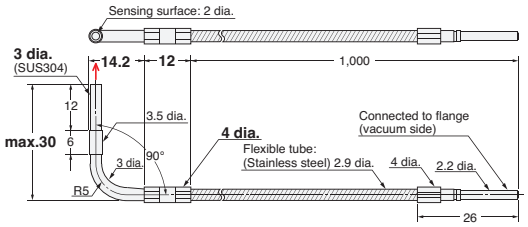

**51-B E32-T51V 1M (No Cutting) + E39-F1V**



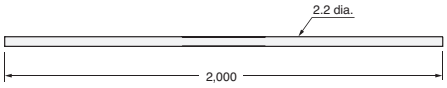

**E39-F1V**



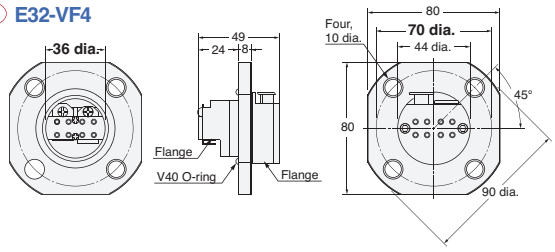

**51-C E32-T84SV 1M (No Cutting)**




**51-D E32-T10V 2M (Free Cutting)**

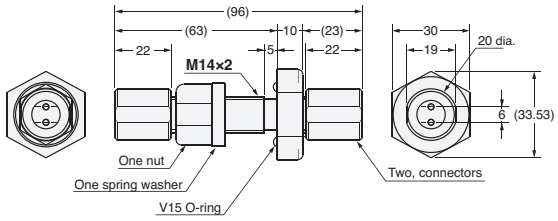



**51-E E32-VF4**




**Note 1.** Mount the Flange so that the V40 O-Ring is on the atmospheric-pressure side of the vacuum chamber wall.
**2.** Mounting-hole dimensions: 38 dia. ±0.5 mm
**3.** The maximum tightening torque is 9.8 N·m.

**51-F E32-VF1**

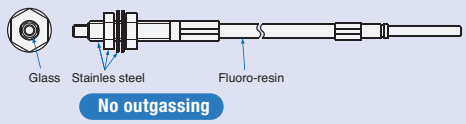


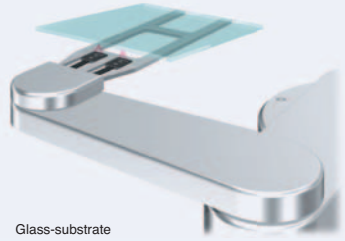

**Note 1.** Mount the Flange so that the V15 O-Ring is on the atmospheric-pressure side of the vacuum chamber wall.
**2.** Mounting-hole dimensions: 14.5 dia. ±0.2 mm
**3.** The maximum tightening torque is 14.7 N·m for the clamp nut and 1.5 N·m for the connector.

## - Reference Information for Model Selection -

### What Is a Vacuum-resistant Fiber Unit?

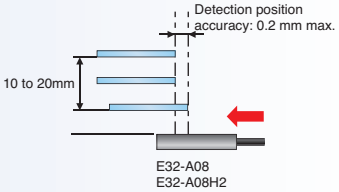
- The Flange is designed to create an air-tight seal on the vacuum side.
- The fibers and Flange on the vacuum side are made of non-outgassing materials.
  These parts are inspected, cleaned, and sealed in an air-tight package in a clean room prior to shipment.





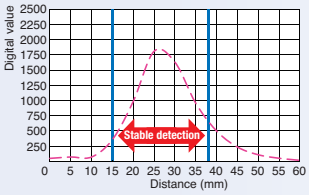
Glass-substrate Alignment

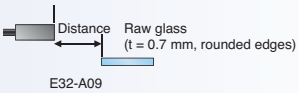
- **Glass-substrate Alignment**
  - Detection position accuracy: 0.2 mm max. No variation in detection positions even if the sensing distance changes.
  - Tilting workpiece does not affect detection.



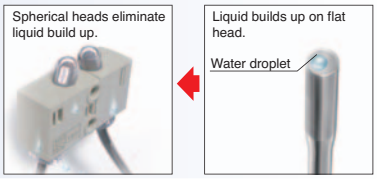

- **Glass-substrate Mapping**

  Stable detection is possible even for difficult-to-detect curved surfaces.



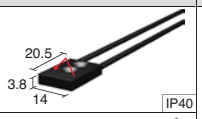
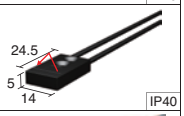
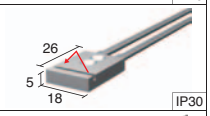
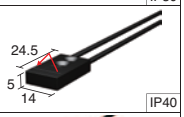
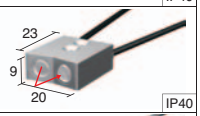
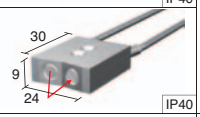
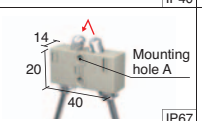
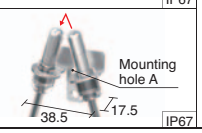




- **Glass Presence Detection in Wet Processes**
  - Stable non-contact detection even with warped glass.
  - The spherical heads ensure stable detection without being influenced by liquid.




## Specifications

### Limited-reflective Fiber Units

| Application | Ambient temperature | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Standard sensing object (minimum sensing object) | Models | 53 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD | | | | |
| | | | | | GIGA HS | Other modes | | | |
| Glass presence detection | 70°C |  IP40 | R25 | 0 to 15 | 0 to 15<br>0 to 15 | ST : 0 to 15<br>SHS: 0 to 12 | Soda glass with reflection factor of 7% | E32-L16-N 2M *1 | 53-A |
| Glass-substrate Alignment | 70°C |  IP40 | | 10 to 20 | 10 to 20<br>10 to 20 | ST : 10 to 20<br>SHS: – | | E32-A08 2M *1 | 53-B |
| | 300°C |  IP30 | | | | | | E32-A08H2 3M *1 | 53-C |
| | 70°C |  IP40 | | 12 to 30 | 12 to 30<br>12 to 30 | ST : 12 to 30<br>SHS: – | | E32-A12 2M NEW | 53-D |
| Mapping of glass substrates | 70°C |  IP40 | | 15 to 38 (Center 25) | 15 to 38<br>15 to 38 (Center 25) | ST : 15 to 38<br>SHS: – | End surface of soda glass with reflection factor of 7% (t = 0.7 mm, rounded edges) | E32-A09 2M | 53-E |
| | 300°C *2 |  IP40 | | 20 to 30 (Center 25) | 20 to 30<br>20 to 30 (Center 25) | ST : 20 to 30<br>SHS: – (Center 25) | | E32-A09H2 2M | 53-F |
| Wet processes (Cleaning, Resist developing, and etching) | 60°C |  IP67 | R40 | 8 to 20 mm from tip of Lens (Recommended sensing distance: 11 mm)<br>19 to 31 mm from center of mounting hole A (Recommended sensing distance: 22 mm) | | | Glass (t=0.7mm) | E32-L11FP 5M | 53-G |
| Wet processes (Resist stripping) | 85°C |  IP67 | | 8 to 20 mm from tip of Lens (Recommended sensing distance: 11 mm)<br>32 to 44 mm from center of mounting hole A (Recommended sensing distance: 35 mm) | | | | E32-L11FS 5M | 53-H |

*1 If operation is affected by the background, perform power tuning or use the ECO Mode to decrease the incident level.
*2 The maximum allowable temperature is not the same for all parts of the Fiber Unit. Refer to the dimensions diagrams for details. Must not be repeatedly subject to rapid temperature changes.

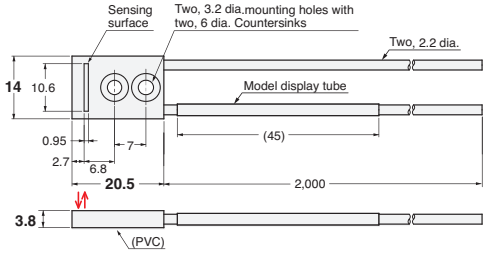
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)

## Dimensions

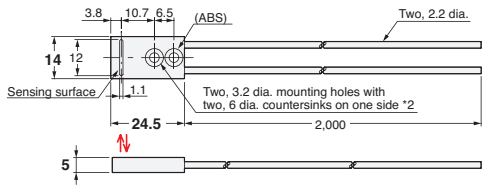
Installation Information → 56 and 57 Page

# Limited-reflective Fiber Units

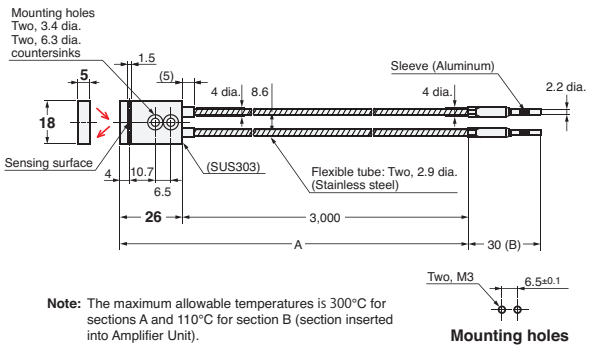
### 53-A E32-L16-N 2M (Free Cutting)




### 53-B E32-A08 2M (Free Cutting)




### 53-C E32-A08H2 3M (No Cutting)

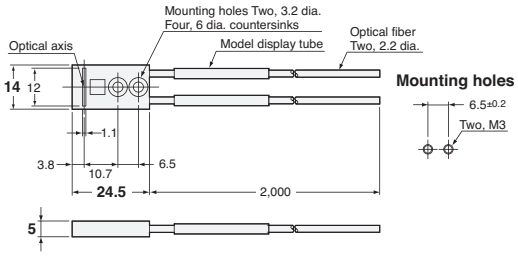



**Note:** The maximum allowable temperatures is 300°C for sections A and 110°C for section B (section inserted into Amplifier Unit).




**Mounting holes**

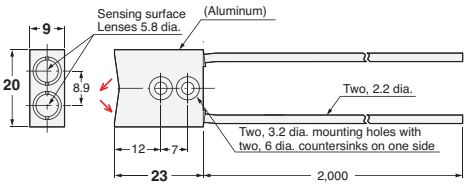
### 53-D E32-A12 2M (Free Cutting)



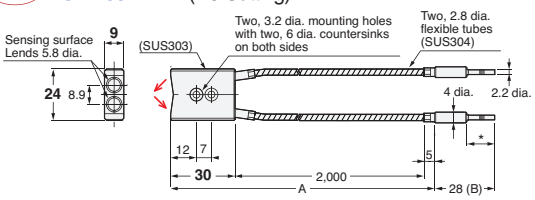

**Mounting holes**




### 53-E E32-A09 2M (Free Cutting)

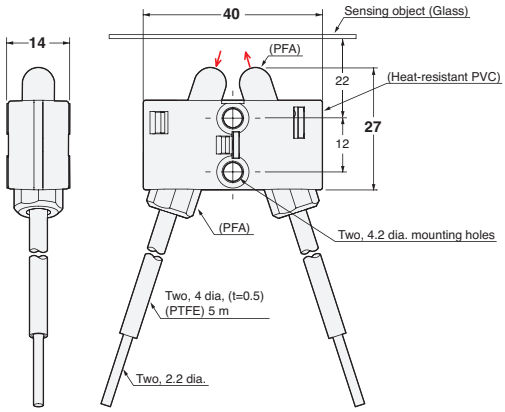



### 53-F E32-A09H2 2M (No Cutting)

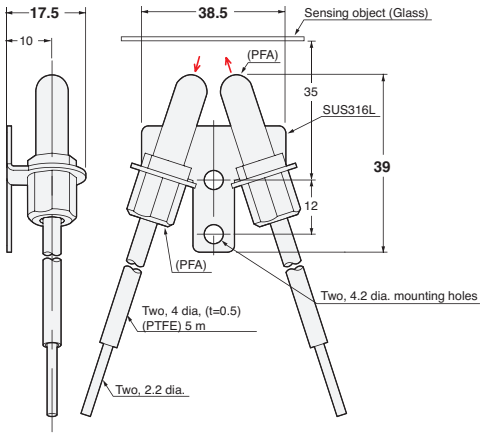


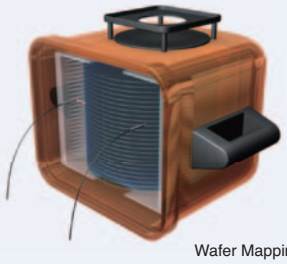

**Note:** The maximum allowable temperatures for sections A and B are 300°C and 110°C, respectively. The section inserted into the Amplifier Unit (indicated by *) must be maintained within the Amplifier Unit's operating temperature range.

### 53-G E32-L11FP 5M (Free Cutting)



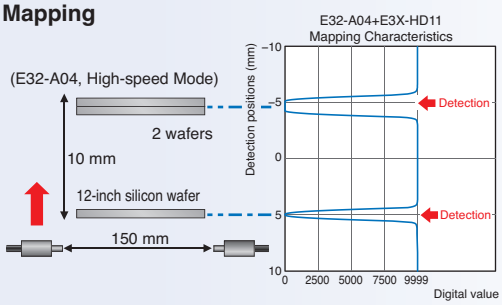

### 53-H E32-L11FS 5M (Free Cutting)





Wafer Mapping

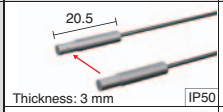
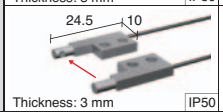
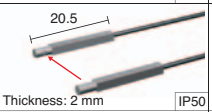
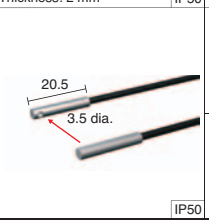
• **Wafer Mapping**




- Thin-profile design enables easy mounting on robot arms.
- Easy to adjust optical axis.
  (Typical alignment error between mechanical and optical axes is only ±0.1°.)
- Reliably wafer detection, even when stacked closely together.

## Specifications

### Through-beam Fiber Units

| Application | Ambient temperature | Aperture angle | Appearance (mm) | Bending radius of cable | Sensing distance (mm) | | | Optical axis diameter (minimum sensing object) | Models | 55 Page Dimensions No. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Simple Fiber Amplifier Units (Simple Models) E3X-SD | Smart Fiber Amplifier Units (Advanced Models) E3X-HD GIGA / HS | Smart Fiber Amplifier Units (Advanced Models) E3X-HD Other modes | | | |
| Wafer Mapping | 70°C | 1.5° |   | Flexible, R1 | 890 | 3,220<br>1,200 | ST : 1,780<br>SHS: 500 | 2 dia. (0.1 dia.) | E32-A03 2M | 55-A |
| | | |   | R10 | | | | | E32-A03-1 2M | 55-B |
| | | 3.4° |   | | 340 | 1,280<br>450 | ST : 680<br>SHS: 200 | 1.2 dia. (0.1 dia.) | E32-A04 2M | 55-C |
| | | 4° |   | Flexible, R1 | 1,170 | 4,000 *<br>1,460 | ST : 2,200<br>SHS: 580 | 2 dia. (0.1 dia.) | E32-T24SR 2M NEW | 55-D |
| | | | | R10 | 1,400 | 4,000 *<br>1,740 | ST : 2,600<br>SHS: 700 | | E32-T24S 2M | 55-E |

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

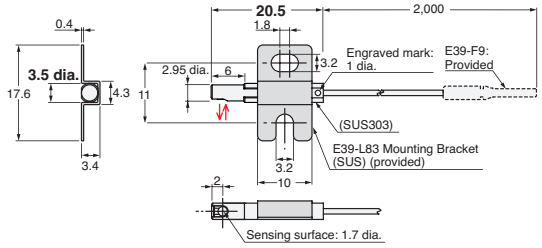
**Note 1.** The mode of E3X-HD that is given under the sensing distances has the following mode names and response times.
GIGA: GIGA Power Mode (16 ms), HS: High-speed Mode (250 μs), ST: Standard Mode (1 ms), and SHS: Super-high-speed Mode (NPN output and E3X-HD0: 50 μs, PNP output: 55 μs)
**2.** The values for the minimum sensing object are representative values that indicate values obtained in Standard Mode with the sensing distance and sensitivity set to the optimum values.

## Dimensions

Installation Information → 56 and 58 Page

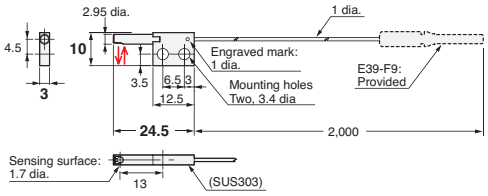
### Through-beam Fiber Units (Set of 2)

#### 55-A E32-A03 2M (Free Cutting)



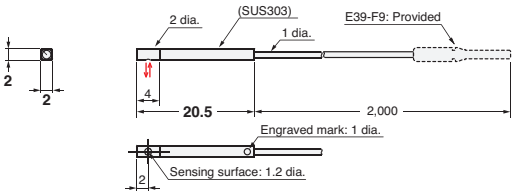

**Note:** Use the engraved surface and its opposing surface as installation (reference) surfaces.

#### 55-B E32-A03-1 2M (Free Cutting)



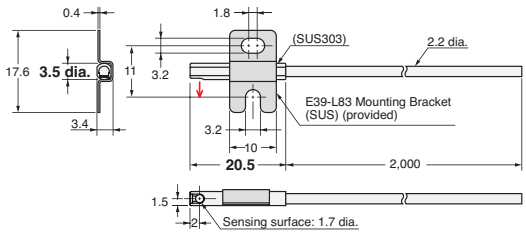

**Note1:** Use the engraved surface and its opposing surface as installation (reference) surfaces.
**2.** Set of two symmetrical parts.

#### 55-C E32-A04 2M (Free Cutting)

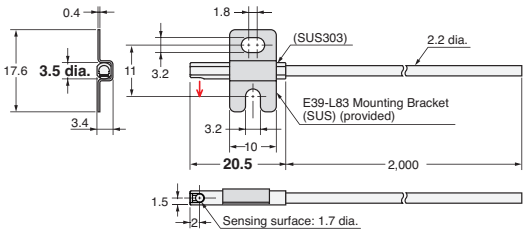



**Note:** Use the engraved surface and its opposing surface as installation (reference) surfaces.

#### 55-D E32-T24SR 2M (Free Cutting)




#### 55-E E32-T24S 2M (Free Cutting)



| Models | Installation | | | Cable | | | | | | Weight (packed state) (g) | Demensions Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ambient temperature | Tightening torque | Mounting hole | Bending radius | Unbendable length | Tensile strength | Sheath material | Core material | Emitter/receiver differentiation | | |
| E32-A01 5M | –40 to 70°C | 0.03N • m | – | R4 | 10 | 9.8N | Fluororesin | Plastic | None | 200 | 49 Page 49-A |
| E32-A03 2M | –40 to 70°C | 0.29N • m | – | R1 | 0 | 9.8N | Polyethylene | Plastic | None | 40 | 29 Page 29-A<br>55 Page 55-A |
| E32-A03-1 2M | –40 to 70°C | 0.29N • m | – | R10 | 10 | 9.8N | Polyethylene | Plastic | None | 50 | 29 Page 29-B<br>55 Page 55-B |
| E32-A04 2M | –40 to 70°C | 0.29N • m | 2.2$^{+0.5}_{0}$ dia. | R10 | 10 | 9.8N | Polyethylene | Plastic | None | 40 | 29 Page 29-C<br>55 Page 55-C |
| E32-A08 2M | –40 to 70°C *1 | 0.53N • m | – | R25 | 10 | 9.8N | Polyethylene | Plastic | None | 60 | 35 Page 35-C<br>53 Page 53-B |
| E32-A08H2 3M | –40 to 300°C | 0.53N • m | – | R25 | 10 | 29.4N | SUS | Glass | None | 240 | 45 Page 45-D<br>53 Page 53-C |
| E32-A09 2M | –40 to 70°C *1, *2 | 0.53N • m | – | R25 | 10 | 9.8N | Polyethylene | Plastic | None | 60 | 35 Page 35-F<br>53 Page 53-E |
| E32-A09H2 2M | –40 to 300°C | 0.53N • m | – | R25 | 10 | 9.8N | SUS | Glass | None | 230 | 45 Page 45-E<br>53 Page 53-F |
| E32-A12 2M | –40 to 70°C | 0.53N • m | – | R25 | 10 | 9.8N | Polyethylene | Plastic | None | 60 | 35 Page 35-D<br>53 Page 53-D |
| E32-C11N 2M | –40 to 70°C | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R4 | 0 | 29.4N | PVC and Polyethylene | Plastic | White line on emitter cable | 70 | 09 Page 09-B |
| E32-C31 2M | –40 to 70°C | 0.78N • m | 3.2$^{+0.5}_{0}$ dia. | R25 | 10 | 9.8N | Polyethylene | Plastic | White line on emitter cable | 40 | 09 Page 09-D |
| E32-C31M 1M | –40 to 70°C | 0.78N • m | 3.2$^{+0.5}_{0}$ dia. | R10 | 10 | 9.8N | Polyethylene | Plastic | White line on emitter cable | 40 | 09 Page 09-E |
| E32-C31N 2M | –40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R4 | 0 | 9.8N | PVC and Polyethylene | Plastic | White line on emitter cable | 40 | 09 Page 09-A |
| E32-C41 1M | –40 to 70°C | 0.78N • m | 3.2$^{+0.5}_{0}$ dia. | R25 | 10 | 9.8N | Polyethylene | Plastic | White tube on emitter cable | 30 | 21 Page 21-A, 21-D |
| E32-C42 1M | –40 to 70°C | 0.29N • m | 2.2$^{+0.5}_{0}$ dia. | R25 | 10 | 9.8N | Polyethylene | Plastic | White tube on emitter cable | 30 | 19 Page 19-A, 19-B |
| E32-C42S 1M | –40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R25 | 10 | 4N | Polyolefin | Plastic | White tube on emitter cable | 30 | 19 Page 19-E |
| E32-CC200 2M | –40 to 70°C | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R25 | 10 | 29.4N | Polyethylene | Plastic | White line on emitter cable | 40 | 09 Page 09-H |
| E32-D11 2M | –40 to 70°C | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R4 | 10 | 29.4N | PVC | Plastic | None | 50 | 41 Page 41-E |
| E32-D11R 2M | –40 to 70°C | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R1 | 0 | 29.4N | PVC | Plastic | None | 50 | 09 Page 09-G |
| E32-D11U 2M | –40 to 70°C | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R4 | 10 | 29.4N | Fluororesin | Plastic | None | 60 | 37 Page 37-I |
| E32-D12F 2M | –40 to 70°C | 0.78N • m | 6.5$^{+0.5}_{0}$ dia. | R40 | 10 | 29.4N | Fluororesin | Plastic | None | 190 | 37 Page 37-H |
| E32-D15XR 2M | –40 to 70°C | 0.15N • m | – | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 15 Page 15-D |
| E32-D15YR 2M | –40 to 70°C | 0.15N • m | – | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 15 Page 15-E |
| E32-D15ZR 2M | –40 to 70°C | 0.15N • m | – | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 15 Page 15-F |
| E32-D16 2M | –40 to 70°C | 0.53N • m | – | R4 | 10 | 29.4N | PVC | Plastic | None | 70 | 23 Page 23-C |
| E32-D21 2M | –40 to 70°C | 0.78N • m | 3.2$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | PVC | Plastic | None | 20 | 41 Page 41-B |
| E32-D211R 2M | –40 to 70°C | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R1 | 0 | 9.8N | Polyethylene | Plastic | None | 40 | 09 Page 09-F |
| E32-D21B 2M | –40 to 70°C | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | PVC | Plastic | None | 40 | 41 Page 41-D |
| E32-D21R 2M | –40 to 70°C | 0.78N • m | 3.2$^{+0.5}_{0}$ dia. | R1 | 0 | 9.8N | Polyethylene | Plastic | None | 20 | 09 Page 09-C |

*1 The heat-resistant rating is not the same for all parts of the Fiber Unit. Refer to the dimensions diagrams for details.
*2 Avoid rapid temperature changes.

| Models | Installation | | | Cable | | | | | | Weight (packed state) (g) | Demensions Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ambient temperature | Tightening torque | Mounting hole | Bending radius | Unbendable length | Tensile strength | Sheath material | Core material | Emitter/receiver differentiation | | |
| **E32-D221B 2M** | −40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | PVC | Plastic | None | 40 | 13 Page 13-D<br>41 Page 41-C |
| **E32-D22B 2M** | −40 to 70°C | 0.2N • m | 1.7$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | PVC | Plastic | None | 30 | 13 Page 13-A<br>41 Page 41-A |
| **E32-D22R 2M** | −40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R1 | 0 | 9.8N | Polyethylene | Plastic | None | 40 | 13 Page 13-C |
| **E32-D24R 2M** | −40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R1 | 0 | 9.8N | Polyethylene | Plastic | None | 40 | 17 Page 17-E |
| **E32-D25XB 2M** | −40 to 70°C | 0.15N • m | – | R4 | 10 | 9.8N | PVC | Plastic | None | 40 | 41 Page 41-F |
| **E32-D32L 2M** | −40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R25 | 10 | 29.4N | Polyethylene | Plastic | Yellow dotted line on emitter cable | 50 | 13 Page 13-E |
| **E32-D33 2M** | −40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | Polyethylene | Plastic | None | 40 | 13 Page 13-F<br>17 Page 17-H |
| **E32-D331 2M** | −40 to 70°C | 0.29N • m | 2.2$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | Polyethylene | Plastic | None | 30 | 17 Page 17-G |
| **E32-D36P1 2M** | −40 to 70°C | 0.78N • m | – | R4 | 10 | 29.4N | Polyethylene | Plastic | None | 60 | 47 Page 47-D |
| **E32-D36T 5M** | −40 to 70°C | – | – | R4 | 10 | 29.4N | Polyethylene | Plastic | None | 190 | 49 Page 49-C |
| **E32-D43M 1M** | −40 to 70°C | 0.29N • m | 1.7$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | Polyethylene | Plastic | None | 30 | 13 Page 13-B<br>17 Page 17-F |
| **E32-D51 2M** | −40 to 150°C *1 | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R35 | 10 | 29.4N | Fluororesin | Plastic | None | 60 | 45 Page 45-B |
| **E32-D51R 2M** | −40 to 100°C *2 | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R2 | 0 | 29.4N | Polyurethane | Plastic | None | 60 | 45 Page 45-A |
| **E32-D61-S 2M** | −60 to 350°C *3 | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R25 | 10 | 29.4N | SUS | Glass | None | 190 | 45 Page 45-G |
| **E32-D611-S 2M** | −60 to 350°C *3 | 0.98N • m | 4.2$^{+0.5}_{0}$ dia. | R25 | 10 | 29.4N | SUS | Glass | None | 170 | 45 Page 45-F |
| **E32-D73-S 2M** | −40 to 400°C *3 | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R25 | 10 | 29.4N | SUS | Glass | None | 170 | 45 Page 45-H |
| **E32-D81R-S 2M** | −40 to 200°C *3 | 0.78N • m | 6.2$^{+0.5}_{0}$ dia. | R10 | 10 | 9.8N | Fluororesin | Glass | None | 70 | 45 Page 45-C |
| **E32-D82F1 4M** | −40 to 200°C | 0.29N • m | 6.5$^{+0.5}_{0}$ dia. | R25 | 10 | 29.4N | Fluororesin | Plastic | None | 450 | 49 Page 49-D |
| **E32-DC200BR 2M** | −40 to 70°C | 0.98N • m | 6.2$^{+0.5}_{0}$ dia. | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 17 Page 17-J |
| **E32-DC200F4R 2M** | −40 to 70°C | 0.78N • m | 3.2$^{+0.5}_{0}$ dia. | R1 | 0 | 9.8N | Polyethylene | Plastic | None | 40 | 17 Page 17-I |
| **E32-L11FP 5M** | −10 to 60°C | 0.78N • m | – | R40 | 10 | 9.8N | Fluororesin | Plastic | None | 310 | 37 Page 37-F<br>53 Page 53-G |
| **E32-L11FS 5M** | −10 to 85°C | 0.78N • m | – | R40 | 10 | 9.8N | Fluororesin | Plastic | None | 310 | 37 Page 37-G<br>53 Page 53-H |
| **E32-L15 2M** | −40 to 70°C | 0.53N • m | – | R25 | 10 | 29.4N | Polyethylene | Plastic | White tube on emitter cable | 60 | 19 Page 19-F |
| **E32-L16-N 2M** | −40 to 70°C | 0.29N • m | – | R25 | 10 | 29.4N | Polyethylene | Plastic | None | 60 | 31 Page 31-A<br>35 Page 35-B<br>53 Page 53-A |
| **E32-L24S 2M** | −40 to 70°C | 0.29N • m | – | R10 | 10 | 9.8N | Polyethylene | Plastic | None | 40 | 31 Page 31-B<br>35 Page 35-A |
| **E32-L25L 2M** | −40 to 105°C *2 | 0.29N • m | – | R10 | 10 | 9.8N | Polyethylene | Plastic | None | 40 | 31 Page 31-C<br>35 Page 35-E |
| **E32-L25T 2M** | −40 to 70°C | – | – | R10 | 10 | 9.8N | Polyethylene | Plastic | None | 40 | 49 Page 49-B |

*1 For continuous operation, use the Fiber Unit between −40 to 130°C.
*2 For continuous operation, use the Fiber Unit between −40 to 90°C.
*3 The heat-resistant rating is not the same for all parts of the Fiber Unit. Refer to the dimensions diagrams for details.

| Models | Installation | | | Cable | | | | | | Weight (packed state) (g) | Demensions Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ambient temperature | Tightening torque | Mounting hole | Bending radius | Unbendable length | Tensile strength | Sheath material | Core material | Emitter/receiver differentiation | | |
| E32-R16 5M | –25 to 55°C | 0.54N • m | – | R25 | 10 | 29.4N | Polyethylene | Plastic | None | 220 (E39-R1 included.) | 33 Page 33-B |
| E32-R21 2M | –40 to 70°C | 0.39N • m | 6.2$^{+0.5}_{0}$ dia. | R10 | 10 | 9.8N | Polyethylene | Plastic | None | 70 (E39-R3 included.) | 33 Page 33-C |
| E32-T10V 2M | –25 to 70°C | 0.3N • m | – | R25 | 10 | 29.4N | Fluororesin | Plastic | None | 170 | 51 Page 51-D |
| E32-T11 2M | –40 to 70°C | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R4 | 10 | 29.4N | PVC | Plastic | None | 40 | 39 Page 39-C |
| E32-T11F 2M | –40 to 70°C | 0.29N • m | – | R4 | 10 | 29.4N | Fluororesin | Plastic | None | 60 | 37 Page 37-C |
| E32-T11N 2M | –40 to 70°C | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R1 | 0 | 29.4N | PVC | Plastic | None | 70 | 07 Page 07-A |
| E32-T11NF 2M | –25 to 70°C | 12N • m | 8.5$^{+0.5}_{0}$ dia. | R1 | 0 | 29.4N | Fluororesin | Plastic | None | 80 | 37 Page 37-A |
| E32-T11R 2M | –40 to 70°C | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R1 | 0 | 29.4N | PVC | Plastic | None | 50 | 07 Page 07-B |
| E32-T12F 2M | –40 to 70°C | 0.78N • m | 5.5$^{+0.5}_{0}$ dia. | R40 | 10 | 29.4N | Fluororesin | Plastic | None | 210 | 37 Page 37-B |
| E32-T12R 2M | –40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 11 Page 11-C |
| E32-T14 2M | –40 to 70°C | 0.49N • m | – | R25 | 10 | 29.4N | Polyethylene | Plastic | None | 60 | 23 Page 23-B |
| E32-T14F 2M | –40 to 70°C | 0.78N • m | 5.5$^{+0.5}_{0}$ dia. | R40 | 10 | 29.4N | Fluororesin | Plastic | None | 220 | 37 Page 37-D |
| E32-T14LR 2M | –40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 11 Page 11-D |
| E32-T15XR 2M | –40 to 70°C | 0.15N • m | – | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 15 Page 15-A |
| E32-T15YR 2M | –40 to 70°C | 0.15N • m | – | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 15 Page 15-B |
| E32-T15ZR 2M | –40 to 70°C | 0.15N • m | – | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 15 Page 15-C |
| E32-T16JR 2M | –40 to 70°C | 0.29N • m | – | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 47 Page 47-B |
| E32-T16PR 2M | –40 to 70°C | 0.29N • m | – | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 47 Page 47-A |
| E32-T16WR 2M | –25 to 55°C | 0.29N • m | – | R1 | 0 | 9.8N | PVC | Plastic | None | 60 | 47 Page 47-C |
| E32-T17L 10M | –40 to 70°C | 0.78N • m | 14.5$^{+1}_{0}$ dia. | R25 | 10 | 29.4N | Polyethylene | Plastic | None | 240 | 23 Page 23-A |
| E32-T21 2M | –40 to 70°C | 0.78N • m | 3.2$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | PVC | Plastic | None | 30 | 39 Page 39-B |
| E32-T223R 2M | –40 to 70°C | 0.20N • m | 1.2$^{+0.5}_{0}$ dia. | R1 | 10 | 9.8N | Polyethylene | Plastic | None | 40 | 11 Page 11-A |
| E32-T22B 2M | –40 to 70°C | 0.20N • m | 1.7$^{+0.5}_{0}$ dia. | R4 | 10 | 9.8N | PVC | Plastic | None | 40 | 11 Page 11-B<br>39 Page 39-A |
| E32-T22S 2M | –40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R10 | 10 | 29.4N | PVC | Plastic | None | 60 | 29 Page 29-F |
| E32-T24E 2M | –40 to 70°C | 0.29N • m | 2.7$^{+0.5}_{0}$ dia. | R10 | 10 | 9.8N | Polyethylene | Plastic | None | 40 | 17 Page 17-B |
| E32-T24R 2M | –40 to 70°C | 0.29N • m | 2.2$^{+0.5}_{0}$ dia. | R1 | 0 | 9.8N | Polyethylene | Plastic | None | 40 | 17 Page 17-A |
| E32-T24S 2M | –40 to 70°C | 0.29N • m | – | R10 | 10 | 29.4N | PVC | Plastic | None | 60 | 29 Page 29-E<br>55 Page 55-E |
| E32-T24SR 2M | –40 to 70°C | 0.29N • m | – | R1 | 0 | 9.8N | PVC | Plastic | None | 60 | 29 Page 29-D<br>55 Page 55-D |
| E32-T25XB 2M | –40 to 70°C | 0.15N • m | – | R4 | 10 | 9.8N | PVC | Plastic | None | 40 | 39 Page 39-D |
| E32-T33 1M | –40 to 70°C | 0.29N • m | 3.2$^{+0.5}_{0}$ dia. | R10 | 10 | 9.8N | Polyethylene | Plastic | None | 40 | 17 Page 17-C |
| E32-T51 2M | –40 to 150°C *1 | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R35 | 10 | 29.4N | Fluororesin | Plastic | None | 70 | 43 Page 43-B |
| E32-T51F 2M | –40 to 150°C *1 | 0.78N • m | 5.5$^{+0.5}_{0}$ dia. | R40 | 10 | 29.4N | Fluororesin | Plastic | None | 220 | 37 Page 37-E |
| E32-T51R 2M | –40 to 100°C *2 | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R2 | 0 | 29.4N | Polyurethane | Plastic | None | 60 | 43 Page 43-A |
| E32-T51V 1M | –25 to 120°C | 0.29N • m | 4.2$^{+0.5}_{0}$ dia. | R30 | 10 | 29.4N | Fluororesin | Glass | None | 160 | 51 Page 51-A |

*1 For continuous operation, use the Fiber Unit between –40 to 130°C.
*2 For continuous operation, use the Fiber Unit between –40 to 90°C.

| Models | Installation | | | Cable | | | | | | Weight (packed state) (g) | Demensions Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ambient temperature | Tightening torque | Mounting hole | Bending radius | Unbendable length | Tensile strength | Sheath material | Core material | Emitter/receiver differentiation | | |
| **E32-T61-S 2M** | –60 to 350°C *1 | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R25 | 10 | 29.4N | SUS | Glass | None | 200 | 43 Page 43-D |
| **E32-T81R-S 2M** | –40 to 200°C *1 | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R10 | 10 | 9.8N | Fluororesin | Glass | None | 60 | 43 Page 43-C |
| **E32-T84SV 1M** | –25 to 200°C | 0.29N • m | 4.5$^{+0.5}_{0}$ dia. | R25 | 10 | 29.4N | SUS | Glass | None | 190 | 51 Page 51-C |
| **E32-TC200BR 2M** | –40 to 70°C | 0.78N • m | 4.2$^{+0.5}_{0}$ dia. | R1 | 0 | 29.4N | PVC | Plastic | None | 60 | 17 Page 17-D |
| **E32-VF1** | –25 to 70°C | – | – | – | – | – | – | – | – | 240 | 51 Page 51-F |
| **E32-VF4** | –25 to 70°C | – | – | – | – | – | – | – | – | 280 | 51 Page 51-E |
| **E39-F1** | –40 to 200°C | – | – | – | – | – | – | – | – | 2 | 24 Page 24-A<br>25 Page 25-A to 25-C<br>26 Page 26-A<br>27 Page 27-A to 27-C |
| **E39-F1-33** | –40 to 200°C | – | – | – | – | – | – | – | – | 3 | 26 Page 26-D<br>27 Page 27-J |
| **E39-F11** | – | – | – | – | – | – | – | – | – | 30 | – |
| **E39-F16** | –60 to 350°C | – | – | – | – | – | – | – | – | 15 | 24 Page 24-B<br>25 Page 25-D to 25-F<br>26 Page 26-B<br>27 Page 27-D to 27-F, 27-K |
| **E39-F17** | –25 to 70°C | – | – | – | – | – | – | – | – | 10 | 19 Page 19-B |
| **E39-F18** | –40 to 70°C | – | – | – | – | – | – | – | – | 5 | 21 Page 21-G, 21-H |
| **E39-F1V** | –25 to 120°C | – | – | – | – | – | – | – | – | 3 | 51 Page 51-B |
| **E39-F2** | –40 to 200°C | – | – | – | – | – | – | – | – | 2 | 24 Page 24-C<br>25 Page 25-G to 25-H<br>26 Page 26-C<br>27 Page 27-G to 27-I |
| **E39-F32A** | –40 to 150°C | – | – | R30 | – | – | – | – | – | 70 | 41 Page 41-G |
| **E39-F32C** | –40 to 150°C | – | – | R30 | – | – | – | – | – | 110 | 39 Page 39-E<br>41 Page 41-G |
| **E39-F32D** | –40 to 150°C | – | – | R30 | – | – | – | – | – | 80 | 41 Page 41-G |
| **E39-F3A** | –40 to 70°C | – | – | – | – | – | – | – | – | 2 | 19 Page 19-A |
| **E39-F3A-5** | –40 to 70°C | – | – | – | – | – | – | – | – | 1 | 21 Page 21-A, 21-B, 21-C |
| **E39-F3B** | –40 to 70°C | – | – | – | – | – | – | – | – | 2 | 21 Page 21-D, 21-E, 21-F |
| **E39-F3C** | –40 to 70°C | – | – | – | – | – | – | – | – | 1 | 19 Page 19-C, 19-D |
| **E39-F3R** | –40 to 70°C | – | – | – | – | – | – | – | – | 1 | 33 Page 33-A |
| **E39-R1** | –25 to 55°C | – | – | – | – | – | – | – | – | 20 | 33 Page 33-B |
| **E39-R3** | –40 to 70°C | – | – | – | – | – | – | – | – | 20 | 33 Page 33-C |
| **E39-RP37** | –25 to 55°C | – | – | – | – | – | – | – | – | 4 | 33 Page 33-A |

*1 The heat-resistant rating is not the same for all parts of the Fiber Unit. Refer to the dimensions diagrams for details.

# Smart Fiber Amplifier Units (Advanced Models)

## E3X-HD



### Access the advanced functions with the tip of your finger.
### Fiber Amplifier Units for long-term, stable detections

- Advanced functions are easily accessible throngh user-friendly design.
- Detects light intensity reduction caused by dirt, vibration, or aging LED performance, and automatically compensates the light intensity and incident level. Long-term stable detection with no maintenance.

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**Intuitive Operation and Visibility**

## Universal Design

### Operation

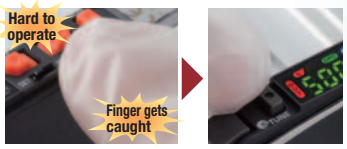
Button symbols make operation easy to learn regardless of operator skill level and language barriers.




User-friendly buttons with error prevention functions.




Pleasing operation even with gloves on.




| Conventional Models | E3X-HD |
|---|---|
| Sliding switches | Pushbutton switches (no sliding switches) |

### Smart Tuning

Smart tuning for the optimum settings with just one button.

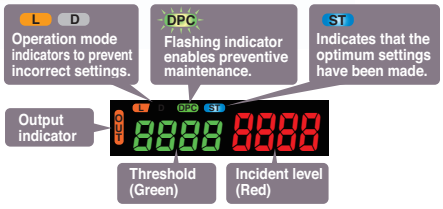
### Arc Design

A strong accent line gives a compact look to improve equipment design.

### Indicators

Enhanced visibility with new digital display and instructional indicators.

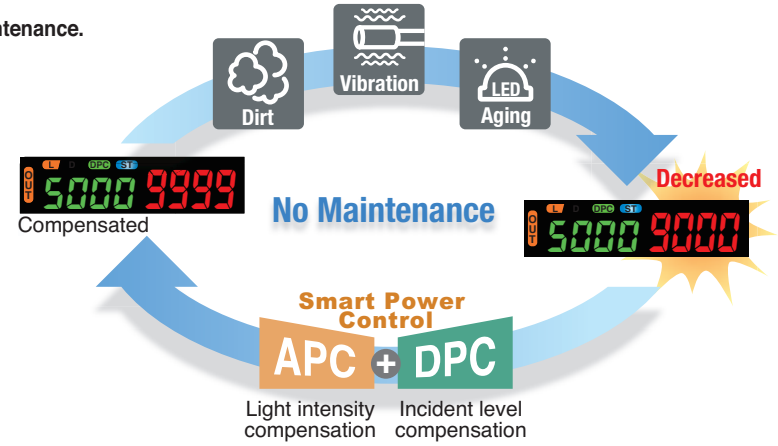
**New Concept: Visible indicators**




**Long-term stable detection with No Maintenance.**

## Smart Power Control

Maintenance-free operation by double compensation of light intensity and incident level.



# Communications Units

## E3X-CRT/E3X-ECT

* Compatible with E3X-HD0



### Communications Units for CompoNet and EtherCAT

- No wiring is roquired to join Fiber Amplifier Units together.
- Setting change and read-out are easy.
- Many Fiber Amplifier Units can be connected.
  (E3X-CRT: 16 Amplifiers, E3X-ECT: 30 Amplifiers)

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# Simple Fiber Amplifier Units (Simple Models)

## E3X-SD



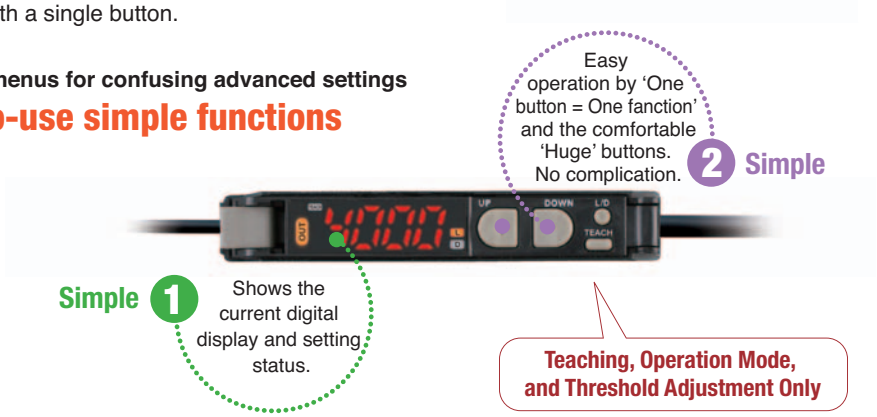

### Simple and Affordable Fiber Amplifier Units with Minimum Required Settings Menu

- The settings menu contains only the settings that are absolutely necessary for using the Fiber Sensor, and each setting is assigned to its own button.
- A single digital display eliminates reading the wrong value.
- Quick tuning to automatically set the incident level and threshold with a single button.

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**No more menus for confusing advanced settings**

**Easy-to-use simple functions**

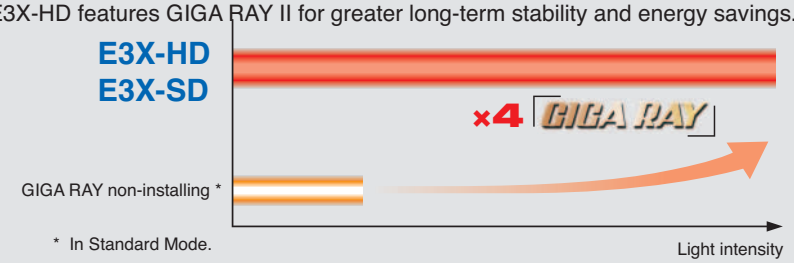


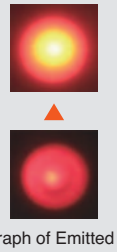

## E3X-HD/E3X-SD

### Featuring the Unparalleled Power of GIGA RAY




- These Fiber Amplifier Units use GIGA RAY power lighting elements, which offer the highest level of power in this class and allow the use of Reflective Fiber Units for reliable detection of low-reflective workpieces and long-distance detection in large-scale equipment.
- The E3X-HD features GIGA RAY II for greater long-term stability and energy savings.



Photograph of Emitted Beam

# Smart Fiber Amplifier Units (Advanced Models) E3X-HD Series

## Fiber Amplifier Units (Standard)

| Appearance | Connection method | Model | | Ratings and Specifications | Dimensions |
|---|---|---|---|---|---|
| | | NPN output | PNP output | | |
|  | Pre-wired (2 m) | E3X-HD11 2M | E3X-HD41 2M | Page 64 | Page 64 64-A |
|  | Wire-saving connector | E3X-HD6 | E3X-HD8 | | Page 65 65-A |

## Fiber Amplifier Unit (For CompoNet/EtherCAT Communications Unit)

| Appearance | Model | Ratings and Specifications | Dimensions |
|---|---|---|---|
|  | E3X-HD0 | Page 64 | Page 65 65-B |

# Communications Units

| Communication method | Appearance | Applicable Fiber Amplifier Model | Model | Ratings and Specifications | Dimensions |
|---|---|---|---|---|---|
| CompoNet |  | E3X-HD0<br>E3X-MDA0<br>E3X-DA0-S | E3X-CRT | Page 70 | Page 71 71-A |
| EtherCAT |  | | E3X-ECT | | Page 71 71-B |

# Simple Fiber Amplifier Units (Simple Models) E3X-SD Series

| Appearance | Connection method | Model | | Ratings and Specifications | Dimensions |
|---|---|---|---|---|---|
| | | NPN output | PNP output | | |
|  | Pre-wired (2 m) | E3X-SD21 2M | E3X-SD51 2M | Page 72 | Page 73 73-A |
|  | Wire-saving connector | E3X-SD7 | E3X-SD9 | | Page 73 73-B |

# Accessories (sold separately)

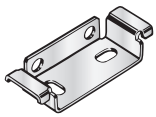
## Wire-saving connectors (Required for wire-saving connector models.)

Connectors are not provided with the Fiber Amplifier Unit and must be ordered separately. * Protective stickers: provided.

| Type | Appearance | Cable length | Number of conductors | Model | Ratings and Specifications | Dimensions |
|---|---|---|---|---|---|---|
| Master Connector |  | 2 m | 3 | E3X-CN11 | Page 76 | Page 76 76-A |
| Slave Connector |  | | 1 | E3X-CN12 | | Page 76 76-B |

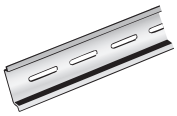
## Mounting Bracket

Mounting Bracket is not provided with the Fiber Amplifier Unit and must be ordered separately as required.

| Appearance | Model | Quantity | Dimensions |
|---|---|---|---|
|  | E39-L143 | 1 | Page 77 77-A |

## DIN Track

Din Track is not provided with the Fiber Amplifier Unit and must be ordered separately as required.

| Appearance | Model | Quantity | Dimensions |
|---|---|---|---|
|  | PFP-100N | 1 | Page 77 77-B |
| | PFP-50N | | |
| | PFP-100N2 | | Page 77 77-C |

## End Plate

Two End Plates are provided with the Communications Unit.
End Plate is not provided with the Fiber Amplifier Unit and must be ordered separately as required.

| Appearance | Model | Quantity | Dimensions |
|---|---|---|---|
|  | PFP-M | 1 | Page 77 77-D |

## Ratings and Specifications

| Item | | Type | Standard | | | | For Communications Unit *1 |
|---|---|---|---|---|---|---|---|
| | | Model | E3X-HD11 | E3X-HD41 | E3X-HD6 | E3X-HD8 | E3X-HD0 |
| | | Connection method | Pre-wired | | Wire-saving connector *2 | | Communications Unit Connector |
| | | Control output | NPN output | PNP output | NPN output | PNP output | - |
| Light source (wavelength) | | | Red, 4-element LED (625 nm) | | | | |
| Power supply voltage | | | 12 to 24 VDC ±10%, ripple (P-P) 10% max. | | | | |
| Power consumption | | | Normal Mode: 720 mW max. (Current consumption: 30 mA max. at 24 VDC, 60 mA max. at 12 DVC)<br>Power Saving Eco Mode: 530 mW max. (Current consumption: 22 mA max. at 24 VDC, 44 mA max. at 12 VDC) | | | | |
| Control output | | | Load power supply voltage: 26.4 VDC max., open-collector output<br>(Differs for NPN and PNP outputs.)<br>Load current: 50 mA max. (residual voltage: 2 V max.), OFF current: 0.5 mA max. | | | | – |
| Protection circuits | | | Power supply reverse polarity protection, output short-circuit protection and output reverse polarity protection | | | | |
| Response time | | Super-high-speed Mode (SHS) *3 | Operate or reset: 50 µs | Operate or reset: 55 µs | Operate or reset: 50 µs | Operate or reset: 55 µs | Operate or reset: 50 µs |
| | | High-speed Mode (HS) | Operate or reset: 250 µs (default setting) | | | | |
| | | Standard Mode (Stnd) | Operate or reset: 1 ms | | | | |
| | | Giga-power Mode (GIGA) | Operate or reset: 16 ms | | | | |
| Mutual interference prevention | | | Possible for up to 10 units (optical communications sync) *3 | | | | |
| Auto power control (APC) | | | Always ON | | | | |
| Other functions | | | Power tuning, differential detection, DPC, timer (OFF-delay, ON-delay, or one-shot), zero reset, resetting settings, and Eco Mode | | | | |
| Ambient Illumination (Receiver side) | | | Incandescent lamp: 20,000 lx max., Sunlight: 30,000 lx max. | | | | |
| Maximum connectable Units | | | 16 units | | | | with E3X-CRT: 16 units<br>with E3X-ECT: 30 units |
| Ambient temperature range | | | Operating: Groups of 1 to 2 Amplifers: –25 to 55°C,<br>Groups of 3 to 10 Amplifers: –25 to 50°C,<br>Groups of 11 to 16 Amplifers: –25 to 45°C<br>Storage: –30 to 70°C<br>(with no icing or condensation) | | | | Operating: Groups of 1 to 2 Amplifers: –25 to 55°C,<br>Groups of 3 to 10 Amplifers: –25 to 50°C,<br>Groups of 11 to 16 Amplifers: –25 to 45°C,<br>Groups of 17 to 30 Amplifers: –25 to 40°C<br>Storage: –30 to 70°C<br>(with no icing or condensation) |
| Ambient humidity range | | | Operating and storage: 35% to 85% (with no condensation) | | | | |
| Insulation resistance | | | 20 MΩ min. (at 500 VDC) | | | | |
| Dielectric strength | | | 1,000 VAC at 50/60 Hz for 1 minute | | | | |
| Vibration resistance | | | Destruction: 10 to 55 Hz with a 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | | |
| Shock resistance | | | Destruction: 500 m/s², for 3 times each in X, Y, and Z directions | | | | |
| Degree of protection | | | IEC 60529 IP50 (with Protective Cover attached) | | | | – |
| Weight (packed state/unit only) | | | Approx. 105 g/Approx. 65 g | | Approx. 60 g/Approx. 20 g | | Approx. 65 g/Approx. 25 g |
| Materials | | Case | Heat-resistant ABS | | | | Heat-resistant ABS (connector: PBT) |
| | | Cover | Polycabonate (PC) | | | | |
| Accessories | | | Instruction Manual | | | | |

*1. The E3X-ECT EtherCAT Communications Unit and the E3X-CRT CompoNet Communications Unit can be used.
*2. Use either the E3X-CN11 (master connector, 3 conductors) or the E3X-CN12 (slave connector, 1 conductor).
*3. The communications function and matual interference prevention function are disabled when the detection mode is set to Super-high-speed mode (SHS).
When including E3X-DA-S with activated power tuning the maximum number of mutual interference prevention is up to 6.
When including E3X-MDA with activated power tuning the maximum number of mutual interference prevention is up to 5.

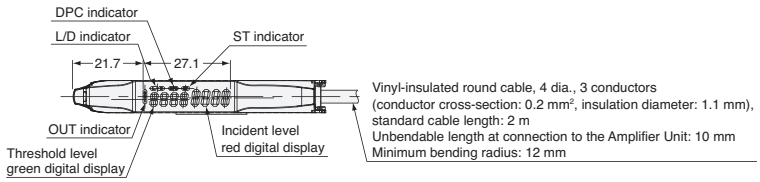
## Dimensions

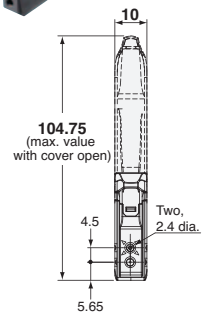
(Unit: mm)
Tolerance class IT16 applies to demmensions in this date sheet unless otherwise specified.

### Pre-wired Models

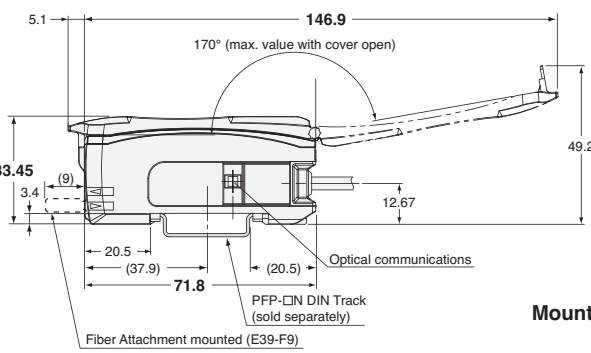
64-A **E3X-HD11**
**E3X-HD41**





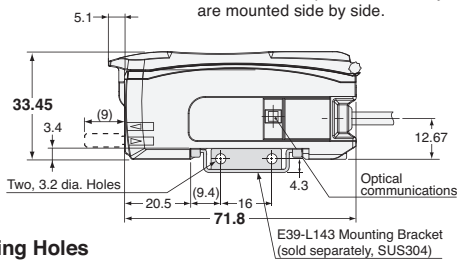




**DIN track mounting**

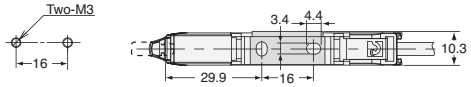



**With Mounting Braket Attached**

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



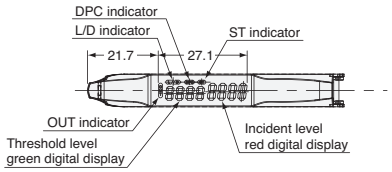

**Mounting Holes**

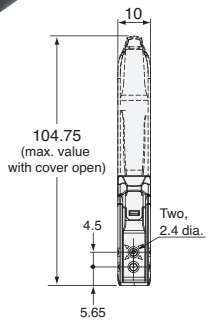


## Wire-saving connector Models

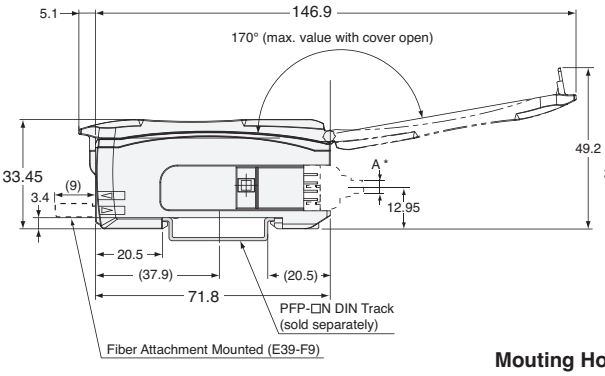
65-A E3X-HD6
E3X-HD8





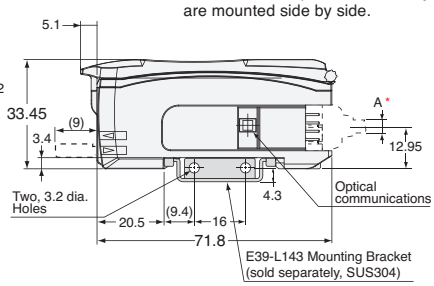




### DIN track mounting

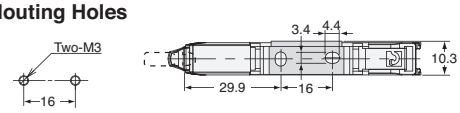



### With Mounting Braket Attached

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




### Mouting Holes



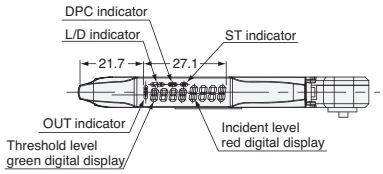

* The cable diameters are as follows:

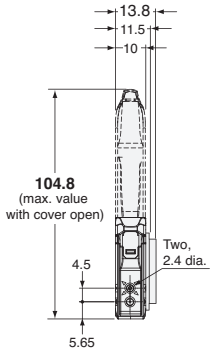
| | |
|---|---|
| **E3X-CN11 (3 conductors)** | 4.0 dia. |
| **E3X-CN21 (1 conductor)** | 2.6 dia. |

## Communications Unit Connector Models

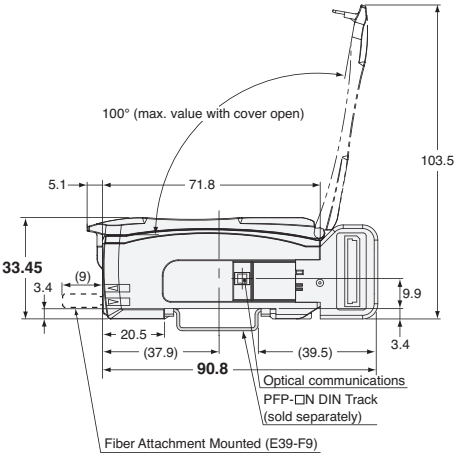
65-B E3X-HD0





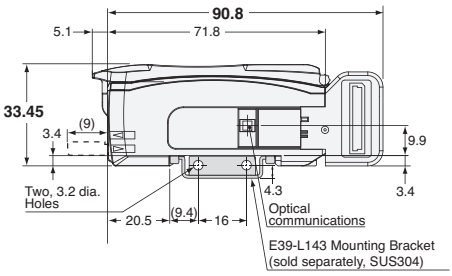




### DIN track mounting

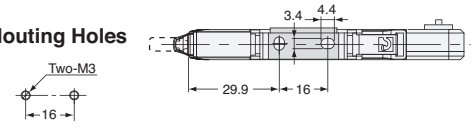



### With Mounting Braket Attached

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




### Mouting Holes



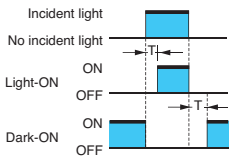
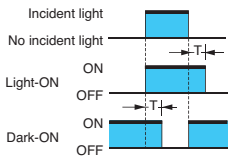
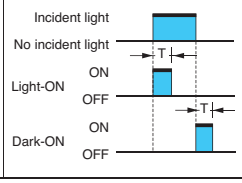
## I/O Circuit Diagrams

### NPN Output

| Model | Operation mode | Timing chart | L/D indicators | Output circuit |
|---|---|---|---|---|
| E3X-HD11<br>E3X-HD6 | Light-ON | Incident light / No incident light<br>OUT indicator (orange): Lit / Not lit<br>Output transistor: ON / OFF<br>Load (e.g., relay): Set / Reset<br>(between brown and black) | L lit. | Display, OUT indicator (orange), Photoelectric Sensor main circuit, Brown, Black, Load, Control output, Blue, 12 to 24 VDC |
| | Dark-ON | Incident light / No incident light<br>OUT indicator (orange): Lit / Not lit<br>Output transistor: ON / OFF<br>Load (e.g., relay): Set / Reset<br>(between brown and black) | D lit. | |

### PNP Output

| Model | Operation mode | Timing chart | L/D indicators | Output circuit |
|---|---|---|---|---|
| E3X-HD41<br>E3X-HD8 | Light-ON | Incident light / No incident light<br>OUT indicator (orange): Lit / Not lit<br>Output transistor: ON / OFF<br>Load (e.g., relay): Set / Reset<br>(between blue and black) | L lit. | Display, OUT indicator (orange), Photoelectric Sensor main circuit, Brown, Black, Control output, Load, Blue, 12 to 24 VDC |
| | Dark-ON | Incident light / No incident light<br>OUT indicator (orange): Lit / Not lit<br>Output transistor: ON / OFF<br>Load (e.g., relay): Set / Reset<br>(between blue and black) | D lit. | |

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



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

## Nomenclature

**[L/D Indicator]**
Indicate the setting status: Light-ON or Dark-ON.

**[OUT Indicator]**
Turns ON when Output is ON.

**[DPC Indicator]**
Turns ON when Dynamic Power Control is effective.

**[ST Indicator]**
Turns ON when Smart Tuning is in progress.

**[△L/D Button]**
Use to switch between Light-ON and Dark-ON.




Threshold Level Green Digital Display

Incident Level Red Digital Display

**[□MODE Button]**
Use to switch between Detection Mode and Setting Mode.

**[TUNE Button]**
Automatically sets the emitter power and set values.

**[±UP/DOWN Button]**
Fine-tunes the threshold, and changes set values.

## Operating Procedures

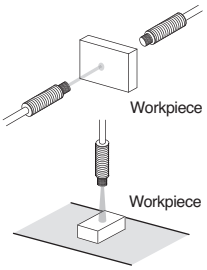
### Basic Settings

### Switching Control Output

1. Press L/D button.

Through-beam:
Set to “Dark ON" to turn the output ON with a workpiece in the detection area.
[L/D Indicator] turns D ON.

Reflective:
Set to “Light ON" to turn the output ON with a workpiece in the detection area.
[L/D Indicator] turns L ON.

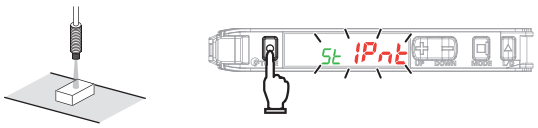



### Smart Tuning [Easy Sensitivity Setting]

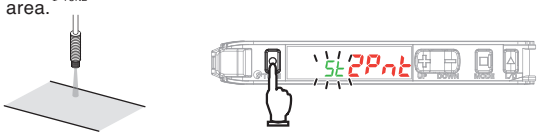
#### (1) Detect for Workpiece Presence/Absence

- **2-point Tuning**

1. Press STUNE button with a workpiece in the detection area.




2. Press STUNE button again without a workpiece in the detection area.




➡ **Setting is Completed**

Incident light level setting:
The larger incident level of the Step 1 and 2 values is adjusted to the power tuning level.
Threshold setting:
Set to the middle between the Step 1 and 2 incident light levels.

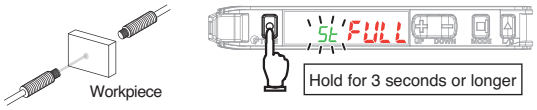
CHECK! Step 1 and Step 2 can be reversed.

#### (2) Detect for Workpiece Presence/Absence

- **Maximum Sensitivity Tuning**

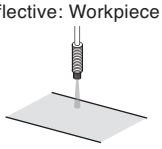
1. Hold STUNE button for 3 seconds or longer with/without workpiece as shown below.
Release the button when [ St FULL ] is displayed.

Through-beam: Workpiece is present




The red digital display changes [ 1Pnt ] →[ FULL ]

Reflective: Workpiece is absent



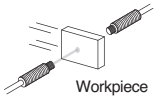
➡ **Setting is Completed**

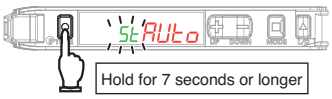
Incident light level setting:
The incident level in Step 1 is adjusted to "0".
Threshold setting:
The value is set to approx. 7% of the incident light level of 1. If the incident light level of 1 is smaller during long distance detection, the minimum value by which an output is correctly turned ON will be set.

#### (3) Adjust for Moving Workpiece without Stopping Line

- **Full Auto Tuning**

1. Hold the STUNE button without the presence of a workpiece, and pass the workpiece through while [ 1Pnt ] → [ FULL ] → [ AUto] is displayed in red digital.
(Keep holding the STUNE button while the workpiece passes through, and hold 7 seconds or longer until [ AUto] is displayed in red digital. After the workpiece passes through, release your finger from the STUNE button.)



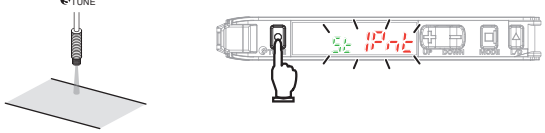

➡ **Setting is Completed**

Incident light level setting:
Adjust the max. incident light level on Step 1 as the power tuning level.
Threshold setting:
Set to the middle between max. and min. incident light levels on Step 1.

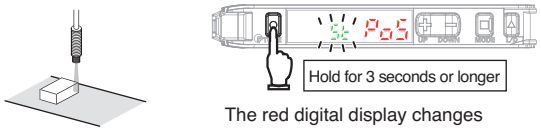
#### (4) Determine Workpiece Position

- **Position Tuning**

1. Press STUNE button without a workpiece in the area.




2. Place the workpiece at the desired position and hold STUNE button.




The red digital display changes [2Pnt] → [Pos].

➡ **Setting is Completed**

Incident light level setting:
The Step 2 incident level is adjusted to half the power tuning level.
Threshold setting:
Set to the same value as the Step 2 incident level.

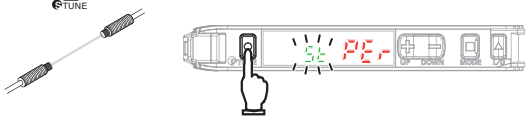
#### (5) Detect Transparent or Small Workpiece (Set Threshold by incident light level percentage)

- **Percentage Tuning**

1. Turn ON Percentage Tuning in SET mode.

Refer to "Detailed Settings".

2. Press STUNE button without a workpiece in the area.




➡ **Setting is Completed**

Incident light level setting:
The Step 2 incident light level is adjusted to the power tuning level.
Threshold setting:
Set to the value obtained by [Incident Level at Step 2 × Percentage Tuning Level + Incident Level at Step 2].

CHECK! No Smart Tuning other than Power Tuning can be used if Percentage Tuning is set.

### ● Smart Tuning Error

| Error / Display / Cause | Error Origin Tuning Type | Remedy |
|---|---|---|
| Near Error<br>nEAr Err<br>The light level difference between Points 1 and 2 are extremely small. | 2-point Tuning<br>Full Auto Tuning<br>Positioning Tuning | • Change the detection function mode to a slower response time mode.<br>• Narrow the emitter and receiver distance (Through-beam)<br>• Mount the sensor closer to the workpiece (Reflective) |
| Over Error<br>ouEr Err<br>Incident light level is too high. | All | • Enhance the power tuning level.<br>• Use a thin-diameter fiber.<br>• Widen the emitter and receiver distance (Through-beam)<br>• Distance the sensor from the workpiece (Reflective) |
| Low Error<br>Lo Err<br>Incident light level is too low. | Tuning other than Maximum Sensitivity Tuning | • Decrease the power tuning level.<br>• Narrow the emitter and receiver distance (Through-beam)<br>• Locate the sensor closer to the workpiece (Reflective) |

CHECK! The adjustment range of smart tuning is approx. 20 to 1/100 times.
When selecting giga mode as detection function, the range will be approx. 2 to 1/100 times due to the large initial value.

Refer to "Detailed Settings" to change the power tuning level.

### Minute Adjustment of Threshold Level

1. Press UP/DOWN button to adjust the threshold level.



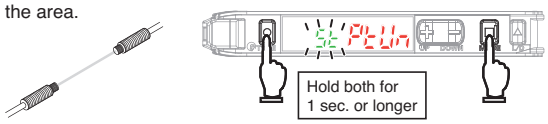

CHECK! Hold the key for high-speed level adjustment.

## Convenient Setting Features

### (1) Restore from the Incident Level Changed due to Dust and Dirt

#### ● Power Tuning

1. Hold TUNE and MODE buttons for 1 second or longer without a workpiece in the area.




➡ **Setting is Completed**

Incident light level setting:
The Step 1 incident level is adjusted to the power tuning level.
Threshold setting:
Not changed. If the value is low, it will be set to the minimum value in which an output is turned ON/OFF correctly.

CHECK! Perform the procedure with a workpiece in the area for reflective model setting.
If the setting is made after position tuning, set both the through-beam model and reflective model with a workpiece.

Refer to "● Smart Tuning Error" for error displays.

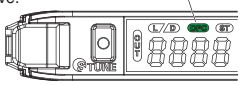
### (2) Stable Detection Regardless of Incident Level Change due to Dust and Dirt

#### ● DPC Function

1. Perform Smart Tuning.

Refer to "Smart Tuning"
Refer to "Power Tuning"

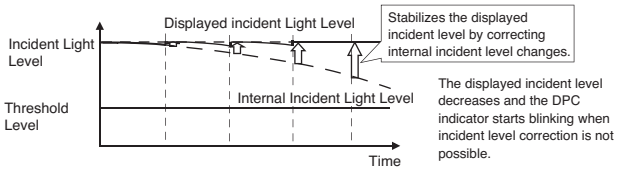
The DPC indicator turns ON when the DPC function is effective.



2. Set the DPC function ON in SET mode.

Refer to "Detailed Settings".

CHECK!
- Steps 1 and 2 can be reversed.
- The DPC function will be disabled when a smart tuning error occurs, differential function with maximum sensitivity tuning is performed, or the first incident light level of the positioning tuning is low.
- The incident light level is corrected to the power tuning level to maintain stable threshold and incident light levels. This provides stable detection regardless of the incident level changes caused by dirty sensor head, position error, or temperature changes.

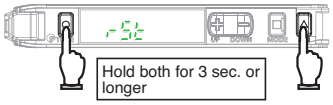



### (3) Reset Settings

#### ● Setting Reset

Initializes all the settings by returning them to the factory defaults.

1. Hold TUNE button and then hold L/D button for 3 seconds or longer.




2. Select [rSt] in UP/DOWN and press MODE button.
3. Select [rSt no it] in UP/DOWN and press MODE button.

| Item | Initial Value |
|---|---|
| Threshold Value | 55 |
| Control Output | L-ON |

* Settings for other functions are returned to the detailed setting initial values.
User-saved settings are retained.
Smart Tuning is canceled.

CHECK! Caution is required; the output is inverted if L/D button is pressed first.

### (4) Save or Read Settings

1. Hold TUNE button and then hold L/D button for 3 seconds or longer.

#### ● User Save Function

Saves the current settings.

2. Select [SAvE] in UP/DOWN and press MODE button.
3. Select [SAvE YES] in UP/DOWN and press MODE button.

#### ● User Reset Function

Reads out the saved settings.

2. Select [rSt] in UP/DOWN and press MODE button.
3. Select [rSt USEr] in UP/DOWN and press MODE button.

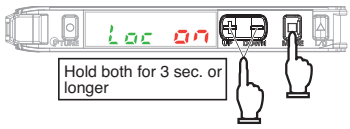
CHECK! Caution is required; the output is inverted if L/D button is pressed first.

### (5) Prevent Mistake-operation

#### ● Key Lock Function

Disables all button operations. [Loc on] is displayed when the button is pressed.

■ **Enable/Cancel (This procedure)**



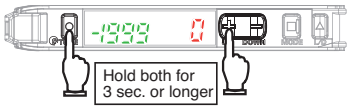

* Press either of UP/DOWN.

### (6) Reset Incident Light Level to "0"

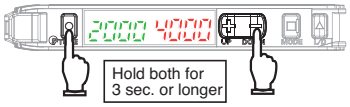
#### ● Zero Reset Function

Changes the incident light level to "0". The threshold level is also shifted accordingly.

■ **Enable**




■ **Cancel**




CHECK! The zero reset function is canceled when either of the DPC function/differential function/Smart Tuning is performed.

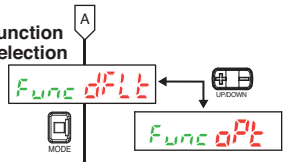
## Detailed Settings

Hold MODE button for 3 seconds or longer to enter SET mode.

SET mode provides the function settings described hereafter. The initial display shown after transition from one function to another represents the factory default.

| Function Setting | Description |
|---|---|

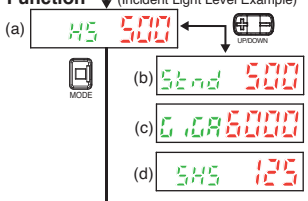
### 1. Function Selection




**Changing Functions to Set in SET Mode**

[oPLt]: Functions 1. to 5. can be set
[oPt]: Functions 1. to 10. can be set.

### 2. Detection Function




**Changing Light Level and Response Time**

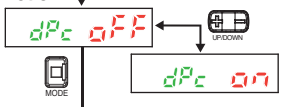
| | Detection Function | | Response Time | Light Level |
|---|---|---|---|---|
| (a) | HS High-speed Mode | | 250 µs | 1 (Standard) |
| (b) | STND Standard Mode | | 1 ms | 1 time |
| (c) | GIGA Giga Mode | | 16ms | 12 times |
| (d) | SHS Super High-speed Mode* | NPN | 50 µs | 0.25 times |
| | | PNP | 55 µs | |

Smart Tuning is canceled if the detection mode is changed.

* The communication and mutual interference prevention functions are disabled when the detection mode is set to Super High-speed Mode.

CHECK! The incident light level in setting mode is a reference value. It may be changed when switched to detection mode.

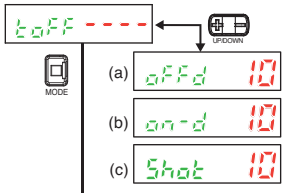
### 3. DPC Function



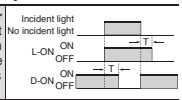
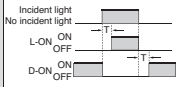
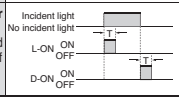

**Stable Detection Regardless of Incident Light Level Change**

Refer to "Convenient Setting Features"

### 4. Timer Function




**Setting Output Timer**

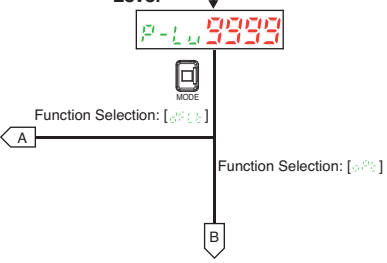
| | | |
|---|---|---|
| (a) | **Off-delay Timer** Holds the output ON for detection by PLC when the detection time is too short. |  |
| (b) | **On-delay Timer** Delays the output ON after detection. |  |
| (c) | **One-shot Timer** Keeps the output ON for a specified time regardless of the workpiece size variations. |  |

A timer value can be set after pressing MODE button when a timer menu (other display than "----") is displayed.

Use UP/DOWN button to set the time.

(1 to 9999 ms in 1 ms steps; the initial value: 10 ms)

### 5. Power Tuning Level




**Changing the Target Incident Light Level (Power Tuning Level)**

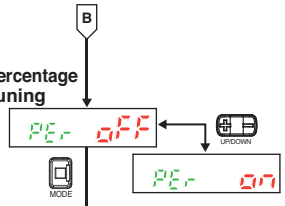
Use UP/DOWN button to set the power tuning level.

[100 to 9999 in 1 steps; the initial value: 9999]

Refer to "Convenient Setting Features"

| Function Setting | Description |
|---|---|

### 6. Percentage Tuning



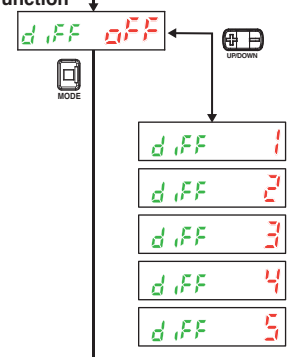

**Detecting Transparent or Small Workpiece**

Press MODE button in [PEr on] menu, then use UP/DOWN button to set the percentage tuning level.

(–99% to 99% in 1% steps; the initial value: –10%)

Refer to "Smart Tuning"

### 7. Differential Function




**Detecting Incident Light Level Change**

Detects if the absolute value of the incident light level change of the set response time is larger than the threshold value. The display shows the change of the incident light level of the set response time in red.

| Differential Setting | Response Time |
|---|---|
| 1 | 250 µs |
| 2 | 500 µs |
| 3 | 1ms |
| 4 | 10 ms |
| 5 | 100 ms |

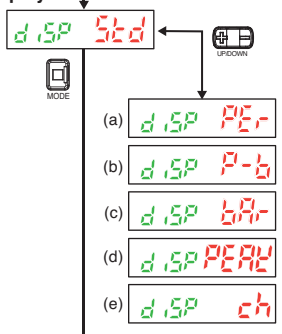
Use UP/DOWN button to specify the response time.

When the differential function is enabled, the detection function setting is disabled.

Smart tunings except power tuning are disabled.

The adjustment range of power tuning is approx. 1 to 1/100 times.

### 8. Digital Display




**Changing Digital Display in RUN Mode for Specific Purpose**

Checking a Margin Against Threshold

(a) Threshold | Light Level Ratio — The ratio of the incident light level to the threshold is displayed in red digital figures.

Setting Threshold using a Small or Fast Moving Workpiece

(b) Peak Light Level | Bottom Light Level — Holds and displays the minimum value of the peak of the light incident and the maximum value of the bottom of the light interruption.

Setting for Intuitive Analog Display

(c) Threshold 120% 100% 80% — Displays the current level in the 80 to 120% range against the threshold value (100%).

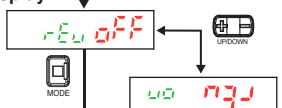
Adjusting Optical Axis

(d) Peak Light Level | Light Level — Holds the peak incident light level and displays it in green digital figures.

Checking the Channel No. in Group Mounting

(e) Ch. No. | Light Level — Checking the Channel No. in Group Mounting.

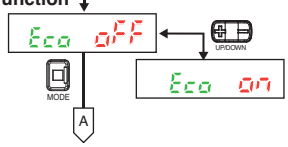
### 9. Inverted Display




**Mounting Amplifier in Inverted Direction**

Inverts the display upside down.
The digital display shows the threshold value in red, and light incident level in green.

### 10. Eco Function




**Saving Power Consumption**

Indicators (Green and Red digital displays) turn OFF in approx. 10 seconds after a key operation.

## Ratings and Specifications

### E3X-CRT

| Item | Specifications |
|---|---|
| Communication method | CompoNet Communications |
| Connectable Sensors | Fiber Sensors: E3X-HD0, E3X-MDA0 and E3X-DA0-S<br>Laser Sensor Head with Separate Digital Amplifier: E3C-LDA0<br>Proximity Sensor with Separate Amplifier: E2C-EDA0 |
| Communications power supply voltage | 14 to 26.4 VDC (Communications Unit draws power from the communications power supply.) |
| Power and current consumption | 2.4 W max. (Not including power the supplied to Sensor.)<br>100 mA max. at 24 VDC (Not including the current supplied to Sensor.) |
| Functions | I/O communications, message communications, and Sensor error output |
| Indicators | MS Indicator (Green/Red), NS indicator (Green/Red), and SS (Sensor Status) indicator (Green/Red) |
| Vibration resistance | 10 to 150 Hz with double amplitude of 0.7 mm, or 50 $m/s^2$<br>1.5 h each in X, Y, and Z directions |
| Shock resistance | 150 $m/s^2$<br>3 times each in X, Y, and Z directions |
| Dielectric strength | 500 VAC 50/60Hz 1 minute |
| Insulation resistance | 20MΩ min. |
| Ambient operating temperature | 0 to 55°C (with no icing or condensation)<br>* The temperature is limited by the number of connected Fiber Amplifier Units. |
| Ambient operating humidity | 25% to 85% (with no icing or condensation) |
| Storage temperature | –30 to 70°C (with no icing or condensation) |
| Storage humidity | 25% to 85% (with no condensation) |
| Mounting method | 35-mm DIN track-mounting |
| Weight (packed state/unit only) | Approx. 220 g/Approx. 95 g |
| Accessories | Connector cover and DIN track End Plates |

**Note.** The E3X-CRT has two operating modes: I/O mode 1 and I/O mode 2.
The following table gives the differences between these modes.

| | I/O classification | Number of allocated points | Maximum number of interconnected |
|---|---|---|---|
| I/O Mode 1 | Input Unit | Input: 32 | 15 |
| I/O Mode 2 | I/O Unit | Input: 64<br>Output: 64 | 16 |

* Temperature Limitations Based on Number of Connected Fiber Amplifier Units:
Groups of 1 to 2 Amplifiers: 0 to 55°C,
Groups of 3 to 10 Amplifiers: 0 to 50°C,
Groups of 11 to 16 Amplifiers: 0 to 45°C

**Read the User's Manual for precautions on using this Unit. (E412)**

### E3X-ECT

| Item | Specifications |
|---|---|
| Communication method | EtherCAT |
| Connectable Sensors | Fiber Sensor E3X-HD0, E3X-MDA0 and E3X-DA0-S<br>Laser Sensor Head with Separate Digital Amplifier: E3C-LDA0<br>Proximity Sensor with Separate Amplifier: E2C-EDA0 |
| Power supply voltage | 20.4 to 26.4 VDC |
| Power and current consumption | 2.4 W max. (Not including power the supplied to Sensor.)<br>100 mA max. at 24 VDC (Not including the current supplied to Sensor.) |
| Functions | DC (synchronous) Mode, Free Run Mode, PDO communications,*1 SDO communications, Sensor error output |
| Indicators | L/A IN indicator (Yellow), L/A OUT indicator (Yellow), PWR indicator (Green), RUN indicator (Green),<br>ERROR indicator (Red), and SS (Sensor Status) indicator (Green/Red) |
| Vibration resistance | 10 to 150 Hz with double amplitude of 0.7 mm, or 50 $m/s^2$<br>1.5 h each in X, Y, and Z directions |
| Shock resistance | 150 $m/s^2$<br>3 times each in X, Y, and Z directions |
| Insulation resistance | 500 VAC 50/60 Hz 1 minute |
| Dielectric strength | 20MΩ min. |
| Ambient operating temperature | 0 to 55°C (with no icing or condensation)<br>* The temperature is limited by the number of connected Fiber Amplifier Units. |
| Ambient operating humidity | 25% to 85% (with no condensation) |
| Storage temperature | –30 to 70°C (with no icing or condensation) |
| Storage humidity | 25% to 85% (with no condensation) |
| Mounting method | 35-mm DIN track-mounting |
| Weight (packed state/unit only) | Approx. 220 g/Approx. 95 g |
| Accessories | Power supply connector, connector cover, and DIN track End Plates |

*1. Data Size Assignable to the PDO (Process Data Object):
There is a maximum data size that can be assigned. The maximum size is 36 bytes.
*2. Temperature Limitations Based on Number of Connected Fiber Amplifier Units:
Groups of 1 to 2 Amplifiers: 0 to 55°C,
Groups of 3 to 10 Amplifiers: 0 to 50°C,
Groups of 11 to 16 Amplifiers: 0 to 45°C,
Groups of 17 to 30 Amplifiers: 0 to 40°C

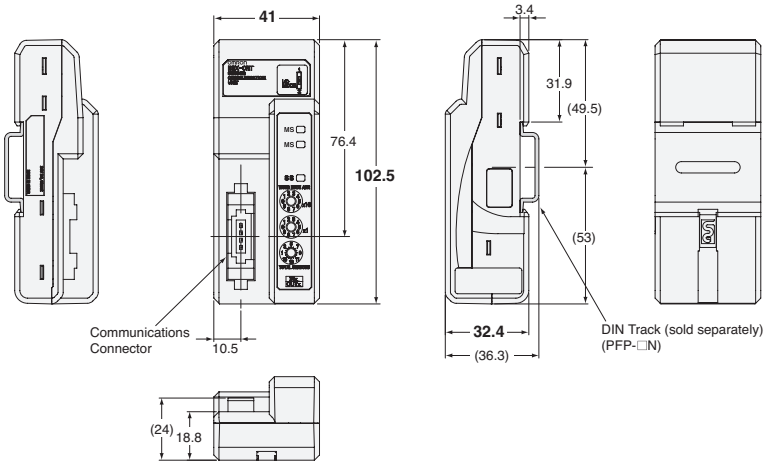
**Read the User's Manual for precautions on using this Unit. (E413)**

## Dimensions

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

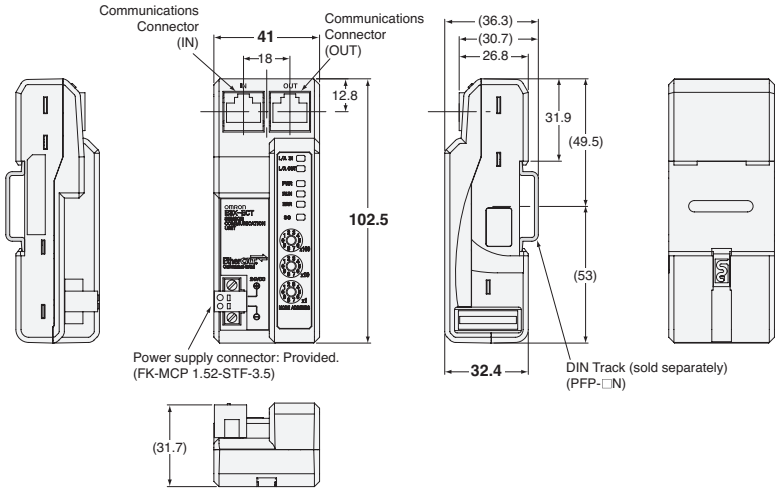
### 71-A E3X-CRT






### 71-B E3X-ECT





## Ratings and Specifications

| Item | | E3X-SD21 | E3X-SD51 | E3X-SD7 | E3X-SD9 |
|---|---|---|---|---|---|
| | Connection method | Pre-wired | | Wire-saving connector | |
| | Control output | NPN output | PNP output | NPN output | PNP output |
| Light source (wavelength) | | Red, 4-element LED (625 nm) | | | |
| Power supply voltage | | 12 to 24 VDC ±10%, ripple (p-p): 10% max. | | | |
| Power consumption | | 960 mW max. (Power supply voltage: 24 V, Current consumption: 40 mA max.)<br>(Power supply voltage: 12 V, Current consumption: 80 mA max.) | | | |
| Control output | | Open-collector output (NPN or PNP) Load power supply: 26.4 V max.,<br>Load current: 50 mA max. (Residual voltage: 1.5 V max.)<br>Light-ON/Dark-ON mode selector | | | |
| Response time | | Operate or reset: 200 µs max. | | | |
| Sensitivity adjustment | | UP/DOWN direct key setting, teaching with/without a workpiece, automatic teaching | | | |
| Protection circuits | | Power supply reverse polarity protection, output short-circuit protection, output reverse polarity protection | | | |
| Mutual interference prevention | | Up to 5 Amplifiers (optically synchronized) * | | | |
| Ambient illumination | | Receiver side<br>Incandescent lamp: 10,000 lx max.<br>Sunlight: 20,000 lx max. | | | |
| Number of gang-mounted Amplifiers | | 16 max. (The ambient temperature specification depends on the number of gang-mounted Amplifiers.) | | | |
| Ambient temperature range | | Operating: Groups of 1 to 3 Amplifiers: –25°C to 55°C<br>Groups of 4 to 11 Amplifiers: –25°C to 50°C<br>Groups of 12 to 16 Amplifiers: –25°C to 45°C<br>Storage: –30°C to 70°C<br>(with no icing or condensation) | | | |
| Ambient humidity range | | Operating and storage: 35% to 85% (with no condensation) | | | |
| Insulation resistance | | 20 MΩ. min. (at 500 VDC) | | | |
| Dielectric strength | | 1,000 VAC at 50/60 Hz for 1 minute | | | |
| Vibration resistance | | Destruction: 10 to 55 Hz with a 1.5-mm double amplitude for 2 hours each in X, Y and Z directions | | | |
| Shock resistance | | Destruction: 500 m/s$^2$, for 3 times each in X, Y and Z directions | | | |
| Degree of protection | | IEC 60529 IP50 (with Protective Cover attached) | | | |
| Weight (packed state) | | Approx. 100 g | | Approx. 55 g | |
| Material | Case | Polybutylene terephthalate (PBT) | | | |
| | Cover | Polycarbonate (PC) | | | |
| Accessories | | Instruction manual | | | |

* Mutual interference prevention is effective when E3X-SD series or E3X-NA serie Amplifiers are gang-mounted without other E3X series Amplifiers.

(Unit: mm)

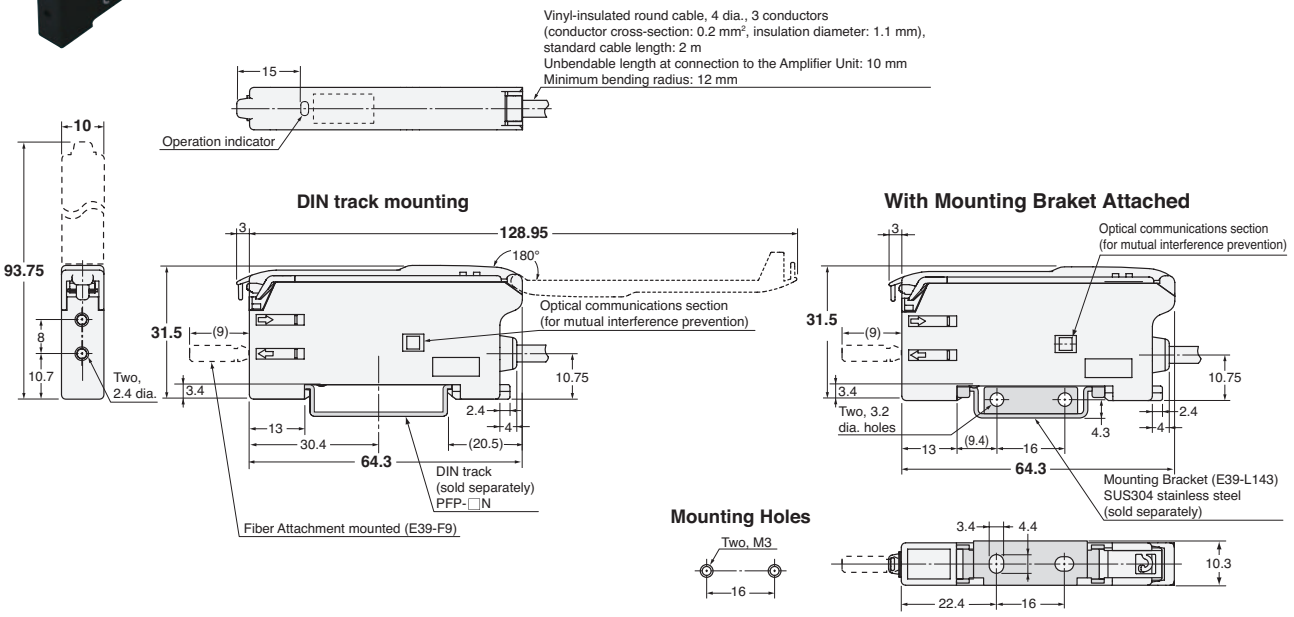
## Dimensions

Tolerance class IT16 applies to demmensions in this date sheet unless otherwise specified.

### Pre-wired Models

73-A **E3X-SD21**
**E3X-SD51**



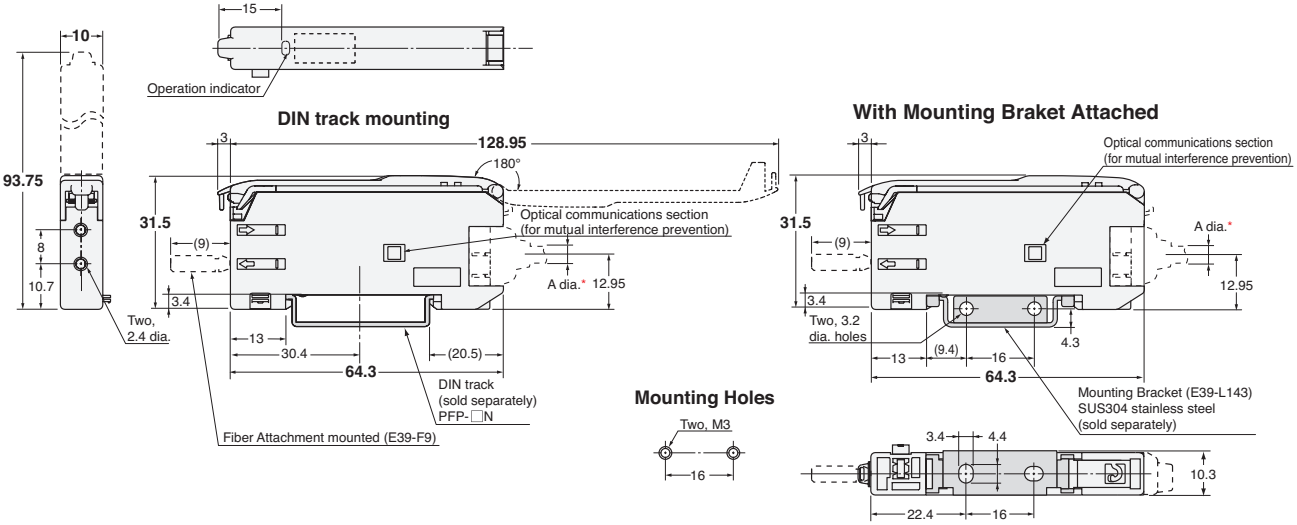



Note: When using E39-L143 Mounting Brackets, there will be small gaps between the Amplifier Units if they are mounted side by side.

### Wire-saving connector Models

73-B **E3X-SD7**
**E3X-SD9**





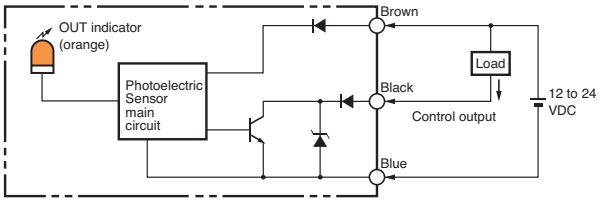

∗ Cable Diameters

| | |
|---|---|
| **E3X-CN11 (3 conductors)** | 4.0 dia. |
| **E3X-CN12 (1 conductors)** | 2.6 dia. |

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

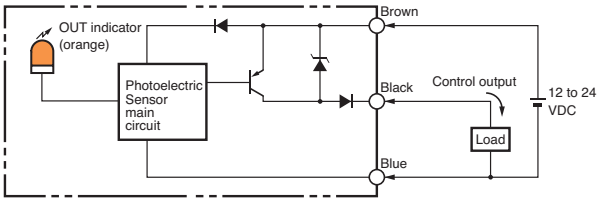
## I/O Circuit Diagrams

### NPN Output

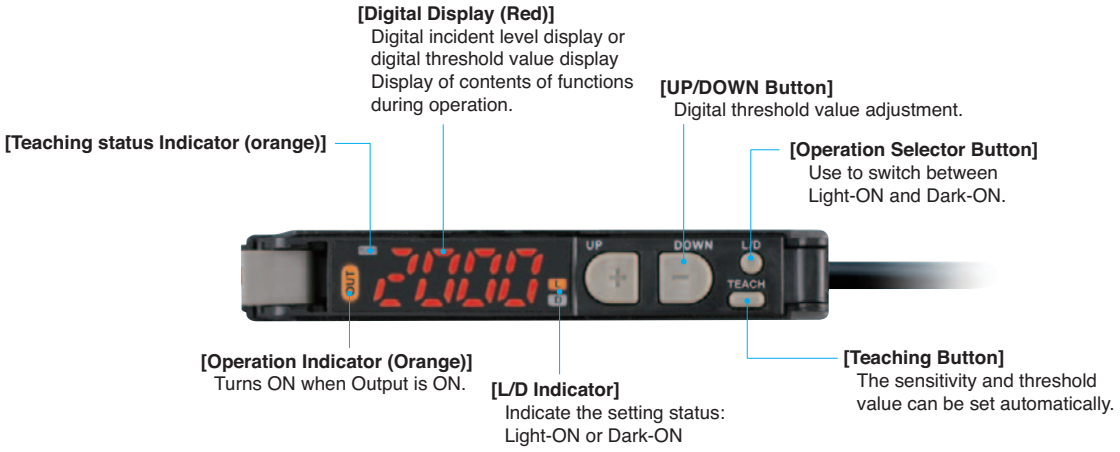
| Model | Operation mode | Timing chart | L/D indicators | Output circuit |
|---|---|---|---|---|
| E3X-SD21<br>E3X-SD7 | Light-ON | Incident light / No incident light<br>OUT indicator (orange): Lit / Not lit<br>Output transistor: ON / OFF<br>Load (e.g., relay): Set / Reset<br>(between brown and black) | L lit. |  |
| | Dark-ON | Incident light / No incident light<br>OUT indicator (orange): Lit / Not lit<br>Output transistor: ON / OFF<br>Load (e.g., relay): Set / Reset<br>(between brown and black) | D lit. | |



### PNP Output

| Model | Operation mode | Timing chart | L/D indicators | Output circuit |
|---|---|---|---|---|
| E3X-SD51<br>E3X-SD9 | Light-ON | Incident light / No incident light<br>OUT indicator (orange): Lit / Not lit<br>Output transistor: ON / OFF<br>Load (e.g., relay): Set / Reset<br>(between Blue and black) | L lit. |  |
| | Dark-ON | Incident light / No incident light<br>OUT indicator (orange): Lit / Not lit<br>Output transistor: ON / OFF<br>Load (e.g., relay): Set / Reset<br>(between Blue and black) | D lit. | |

## Nomenclature




## Operating Procedures

### Sensitivity Setting

The sensitivity can be set with the UP and DOWN Keys similar to using an adjuster knob. The sensitivity can also be easily set by using the following two teaching functions.

#### Teaching with/without a Workpiece

Two points (one with the workpiece and the other without) are detected, and the operating level is set to the midpoint.
Light level is also automatically set to the optimal value.

| Operation description | Button/Key |
|---|---|
| Press the TEACH button with the workpiece. | TEACH |
| Press the TEACH button without the workpiece. | TEACH |

#### Automatic Teaching

Changes within a time are detected, and the operating level is set to the midpoint between the maximum and the minimum values of the changes. This setting is optimal for when the workpieces cannot be stopped. Execute automatic teaching again if the incident light level is not automatically set to the optimal value.

| Operation description | Button/Key |
|---|---|
| Press the TEACH button for 3 s min.<br>Let the workpiece pass while the button is pressed. | TEACH |

## Ratings and Specifications

### Wire-saving Connectors

| Item | Type | Master Connector | Slave Connector |
|---|---|---|---|
| | Model | E3X-CN11 | E3X-CN12 |
| Number of conductors | | 3 | 1 |
| Diameter of cable | | 4 dia. | 2.6 dia. |
| Rated current | | 2.5 A | |
| Rated voltage | | 50 VDC | |
| Contact resistance | | 20 mΩ max. (20 mVDC max., 100 mA max.)<br>(The above figure is for connection to the Amplifier Unit and the adjacent Connector.<br>It does not include the conductor resistance of the cable.) | |
| Number of insertions | | Destruction: 50 times (for connection to the Amplifier Unit and the adjacent Connector) | |
| Material | Housing | Polybutylene terephthalate (PBT) | |
| | Contact | Phosphor bronze/gold-plated nickel | |
| Weight (packed state) | | Approx. 55 g | Approx. 25 g |

## Dimensions

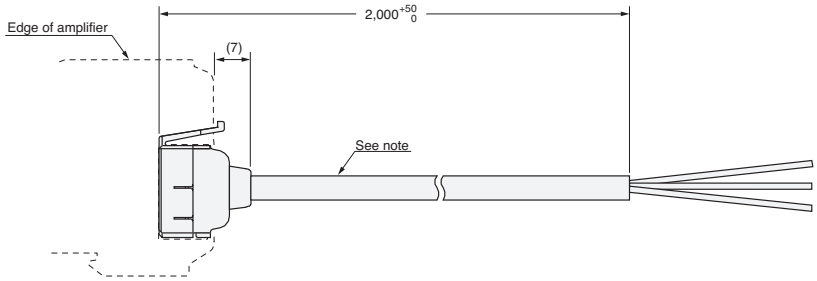
(Unit: mm)
Tolerance class IT16 applies to demmensions in this date sheet unless otherwise specified.

### Wire-saving Connectors

#### Master Connector

76-A E3X-CN11



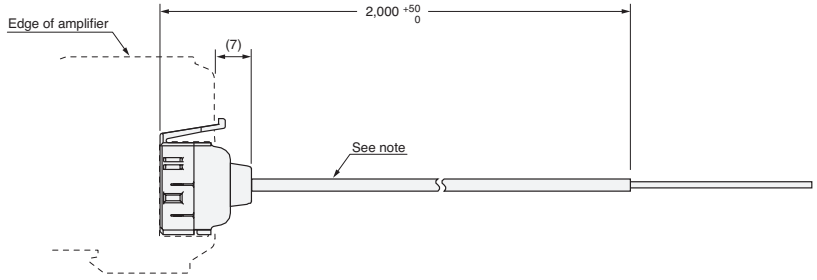



**Note:** 4 dia. cable / 3 conductors / Standard length: 2 m (Conductor cross section: 0.2 mm² (AWG24), Insulator diameter: 1.1 mm)

#### Slave Connector

76-B E3X-CN12

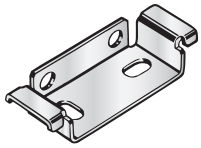


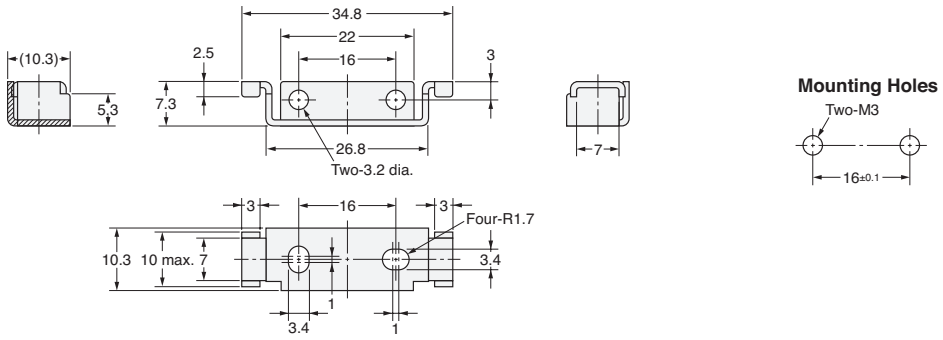



**Note:** 2.6 dia. cable / 1 conductor / Standard length: 2 m (Conductor cross section: 0.2 mm² (AWG24), Insulator diameter: 1.1 mm)

## Mounting Brackets

77-A **E39-L143**



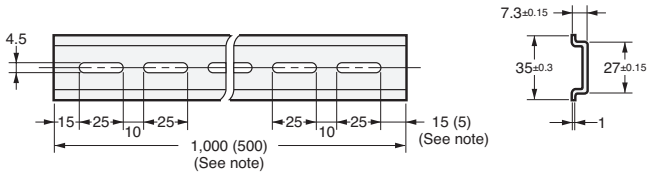



Material: Stainless steel (SUS304)

### DIN track

77-B **PFP-100N**
**PFP-50N**

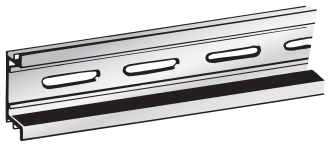


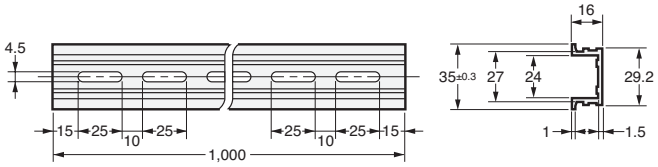



Material: Aluminum

**Note:** The figures in parentheses are for the PFP-50N.

77-C **PFP-100N2**

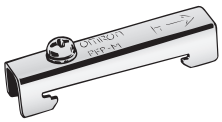


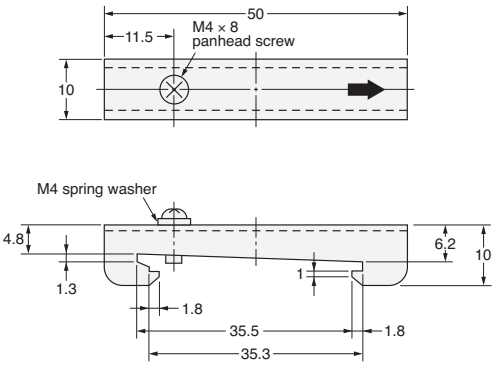



Material: Aluminum

### End Plate

77-D **PFP-M**



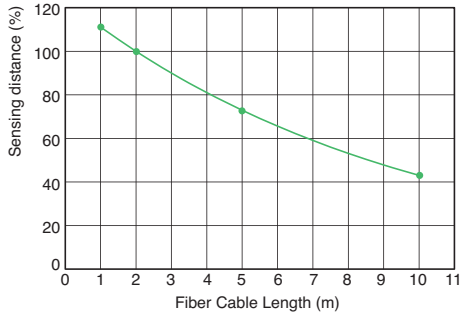



Material: Iron, galvanization

# Reference Information for Fiber Units

## Influence of Fiber Cable Length

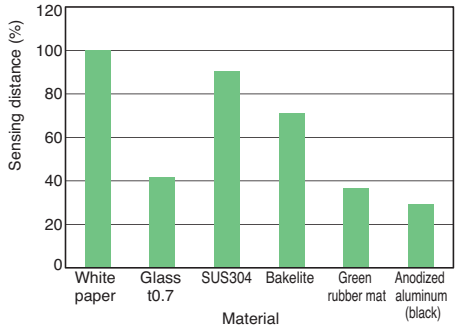
The sensing distance listed in the Fiber Units specifications are based on the fiber cable lengths found in the suffix of the model number.
The sensing distance will change if the fiber cable is cut or extended.
The following graph shows the percentage change of the various fiber cable length, where 100% is the sensing distance for a fiber cable with a length of 2 m.
Use this as a guideline for installation distances.
Keep in mind that extending the cable with a fiber connector will result in even shorter sensing distances than the value given in the graph.




* The 100% value is for a fiber cable with a length of 2 m (same for Through-beam and Reflective Models).

## Reflective Models: Sensing Distance Ratios by Workpiece Materials

The following graph shows the percentage change of the various workpieces, where 100% is the sensing distance for white paper, the standard sensing object.
Refer to the value of the material that looks like your workpiece.



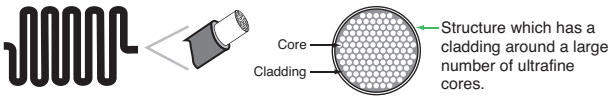

* White paper is 100%.

## Types of Fiber Cables

This section describes the features of different types of fiber cables.
(This is given in the Fiber Unit specifications as either Flexible or Bend-resistant for the cable bending radius, and Coaxial for the appearance.
If no difinition is given, a standard cable is used.)

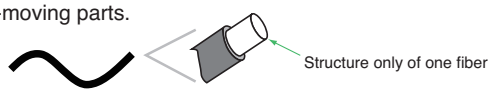
### • Flexible Fibers

The flexible fiber has a small bending radius for easy routing without easily breaking.
It is easy to use because the cable can be bent without significantly reducing light intensity.



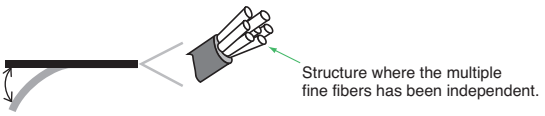

### • Standard Fibers

This fiber have a large bending radius compared with bend-resistant or flexible fiber.
Use this fiber where the bending radius is large, or on non-moving parts.



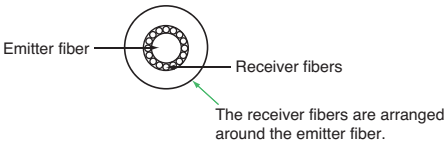

### • Break-resistant Fibers

This fiber is resistant to repeated bends for use on moving parts.

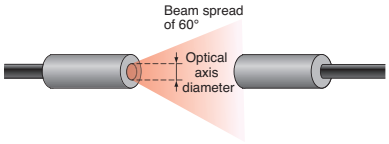
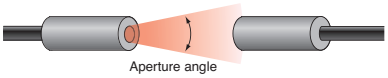



### • Coaxial Reflective Fibers

These fibers are suitable for sensing small objects at close range.



## Q&A

| Category | Question | Answer |
|---|---|---|
| Fiber Units | How do I interpret the optical axis diameter in the Fiber Unit specifications? | The optical axis diameter is the beam size that the Through-beam Fiber Unit uses for detection.<br>If you are detecting objects larger than the optical axis diameter, you can expect stable detection performance because the object will block all of the beams of light that are used for detection.<br>The incident level may fluctuate, however, if the workpiece passes the beam at high speed.<br>In this case, it is best to select a Fiber Unit with a smaller optical axis diameter, or change the response time of the Fiber Amplifier Unit (E3X-HD Series) to High-speed mode or to Super-high-speed mode setting.<br>  |
| | Are there any differences between the Fiber Units that are used for emitter and receiver? | With Through-beam Fiber Units, there is no difference between emitter fibers and receiver fibers.<br>With Reflective Fiber Units, the emitter fibers and receiver fibers are different on Coaxial Reflective Models.<br>Emitter fiber cables have identification marks. Refer to the individual dimensions diagrams for details. |
| | What size must the hole be to mount a Threaded or Cylindrical Fiber Unit? | Refer to the recommended mounting hole dimensions given on pages 56 to 59. |
| | Are Fiber Cables available in different lengths? | Some models are available with either 5-m or 10-m cable.<br>Ask your OMRON representative for details. |
| | What is the aperture angle? | The aperture angle is the angle at which the emitter beam spreads out.<br>  |
| | Are these Fiber Units CE certified? | Fiber Units do not have any electrical components and therefore are exempt from CE certification. |
| | Can these Fiber Units be used in explosion-proof areas? | The Fiber Units can be used in an explosion-proof area. Install only the Fiber Unit in the explosion-proof area and install the Fiber Amplifier Unit outside the explosion-proof area. |
| Fiber Amplifier Units | What is the difference between the E3X-HD Series and E3X-SD Series? | The E3X-HD Series provides Advanced Models with two displays. The E3X-SD Series provides only the minimum required features with a single display. |
| | Can the Fiber Amplifier Units be connected with other models? | The E3X-HD Series can be connected only with the E3X-DA-S and MDA Series.<br>The E3X-SD Series can be connected only with the E3X-NA Series. |
| | Can the Fiber Amplifier Unit be operated from a mobile console? | Mobile consoles cannot be used with either the E3X-HD Series or the E3X-SD Series. |
| | Can the Fiber Amplifier Unit be used with a Communications Unit? | If you use E3X-HD0 Amplifier Units, you can use either the E3X-CRT or E3X-ECT.<br>The E3X-SD Series cannot be used with a Communications Unit. |

## Fiber Amplifier Unit

### ⚠ Warning

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



### ⚠ Caution

**Do not use the product with voltage in excess of the rated voltage.**
**Excess voltage may result in malfunction or fire.**



**Never use the product with AC power supply.**
**Using an AC power supply may result in rupturing.**



### Precautions for Safe Use

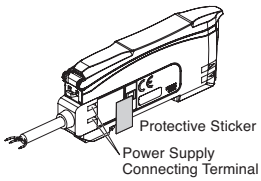
The following precautions must be observed to ensure safe operation of the Sensor.

(1) Do not use the Sensor in environments subject to flammable or explosive gases.
(2) Do not use the Sensor in environments subject to exposure to water, oil, chemicals, etc.
(3) Do not install the Sensor in environments subject to intense electric field or ferromagnetic field.
(4) Do not attempt to disassemble, repair, or modify the Sensor Unit in any way.
(5) Do not apply voltages or currents that exceed the rated ranges.
(6) Do not use the Sensor in any atmosphere or environment that exceeds the ratings.
(7) Do not miswire such as the polarity of the power supply.
(8) Connect the load correctly.
(9) Do not short both ends of the load.
(10) Do not use the Sensor if the case is damaged.
(11) When disposing of the Sensor, treat it as industrial waste.
(12) High-Voltage lines and power lines must be wired separately from this Sensor. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.
(13) When setting the Sensor, be sure to check safety such as by stopping the equipment.

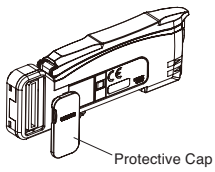
### Precautions for Correct Use

- Do not install the Sensor in the following locations.
  (1) Locations subject to direct sunlight
  (2) Locations subject to condensation due to high humidity
  (3) Locations subject to corrosive gas
  (4) Locations subject to vibration or mechanical shocks exceeding the rated values
- Use an extension cable with a minimum thickness of 0.3 $mm^2$ and less than 100 m long.
- Do not apply the forces on the cord exceeding the following limits: Pull: 40 N; torque: 0.1 N·m; pressure: 20 N; bending: 3 kg
- The Sensor is ready to operate 200 ms after the power supply is turned ON. If the Sensor and load are connected to power supplies separately, turn ON the power supply to the Sensor first.
- When using the wire-saving connector type, attach the protective sticker (provided with E3X-CN series connectors) on the unused power pins to prevent electrical shock and short circuiting.
  When using the connector type for the communications unit, attach the protective cap.

<Wire-saving connector models>




<Communications Unit with a connector>

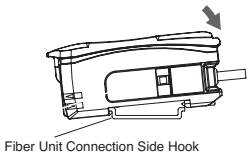



- Output pulses may occur when the power supply is turned OFF. Turn OFF the power supply to the load or load line first.
- Excessive incident light cannot be sufficiently handled by the mutual interference prevention function and may cause malfunction. To prevent this, set a higher threshold level.
- Make sure that the power supply is turned OFF before connecting, separating or adding Amplifier Units.
- Do not pull or apply excessive pressure or force (exceeding 9.8 N) on the Fiber Unit when it is mounted on the Amplifier Unit.
- The E3X-MC11, E3X-MC11-SV2 and E3X-MC11-S Mobile Consoles cannot be used.
- Mutual interference prevention on the E3X-HD Series does not function among the E3X-DA-N, E3X-SD, or E3X-NA Fiber Amplifier Units.
  Mutual interference prevention on the E3X-HD Series does function among the E3X-DA-S and E3X-MDA Fiber Amplifier Units.
  Mutual interference prevention works only when all of the Fiber Amplifier Units are from the E3X-SD Series or the E3X-NA Series.
- The E3X-HD0 can be used with E3X-CRT or E3X-ECT Communications Unit, but the E3X-DRT21-S cannot.
  The E3X-SD Series and the E3X-HD Standard Models (E3X-HD11, E3X-HD41, E3X-HD6, and E3X-HD8) cannot be used with either of the Communications Units.
- If the output short-circuit protection is activated by an overload or short circuit in a control output, `cUr oUEr` will flash on the display. Check the connection of the load.
- If a write error occurs due to noise caused by a power interruption or static electricity (`EEP Err` will flash on the display), use the setting keys on the Fiber Amplifier Unit to initialize it.
- Always keep the protective cover in place when using the Amplifier Unit.
- Do not use thinner, benzine, acetone, and lamp oil for cleaning.

## Mounting the Fiber Amplifier Units

### ■ Mounting on DIN Track

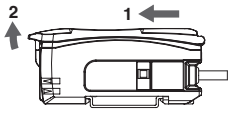
1. Let the hook on the Amplifier Unit's Fiber Unit connection side catch the track and push the unit until it clicks.




### ■ Removing from DIN Track

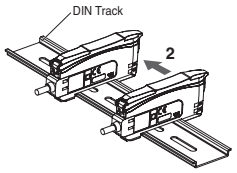
1. Push the unit in the direction 1.
2. Lift it up in the direction 2.

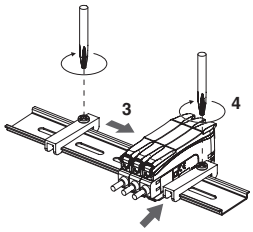
Refer to "I/O Circuit Diagrams" or check the side of the unit for wire color and role indications.




### ■ Mounting Amplifier Units in Group (Connector Type Models)

1. Mount the Fiber Amplifier units one at a time onto the DIN track and push them until they click.
   Use E3X-CN11 (Master connector) for the master Fiber Amplifier unit and E3X-CN12 (Slave connector) for the slave Fiber Amplifier units.
2. Slide the Fiber Amplifier units in the direction 2.
3. Use End Plates (PFP-M: separately sold) at the both ends of the grouped Fiber Amplifier units to prevent them from separating due to vibration or other cause.
4. Tighten the screw on the End Plates using a driver.




Tighten the screw while pressing the End Plate.

CHECK!

- Under environments such as vibration, use an end plates even with a single Fiber Amplifier Unit.
- The maximum numbers of connectable Amplifier Units are given in the following table.

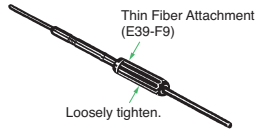
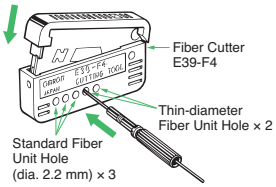
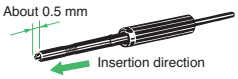
| | | Maximum number of interconnected | Maximum number of mutual interference prevention |
|---|---|---|---|
| E3X-HD series Standard type (E3X-HD11/HD41/HD6/HD8) | | 16 | 10 |
| E3X-HD0 | With E3X-ECT | 30 | 10 |
| | With E3X-CRT | 16 | 10 |
| E3X-SD series (E3X-SD21/SD51/SD7/SD9) | | 16 | 5 |

- If Units are to be connected, the ambient temperature will change with the number of Units that are connected. Check the Ratings and Characteristics specifications.
- Always turn OFF the power before connecting or disconnecting Units.

## Mounting Fiber Units

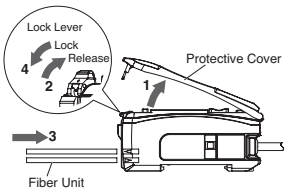
### ■ Use Fiber Cutter

Cut a thin fiber as follows.
For standard fibers, insert to the desired cutting position and cut.

| | | |
|---|---|---|
| (1) | **The fiber is shipped loosely tightened as shown in the figure at the right** |   |
| (2) | **Adjust the fiber to the desired length and fully tighten.** |  |
| (3) | **Insert the Fiber Unit into E39-F4 and cut it.** |   |
| (4) | **Finished state. (Correctly cut end)** |   **Note:** The insertion direction into the Fiber Amplifier Unit is shown in the above figure. |

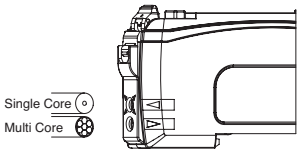
### ■ Mount Fiber Unit

1. Open the protective cover.
2. Raise the lock lever.
3. Insert the Fiber Unit in the fiber unit hole to the bottom.
4. Return the lock lever to the original position and fix the Fiber Unit.




CHECK!

- When mounting a coaxial reflective Fiber Unit, insert the single-core Fiber Unit to the upper hole (Emitter side) and the multi-core Fiber Unit to the lower hole (Receiver side).




- When removing the Fiber Unit, follow the above steps in reverse order.
  To maintain the characteristics of the Fiber Unit, make sure the lock is released before removing the Fiber Unit.

## Fiber Units

### ⚠ Warning

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



### Precautions for Correct Use

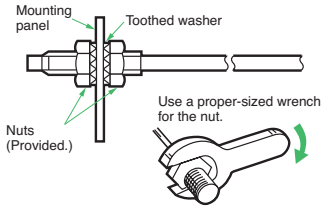
Do not use the Fiber Unit in atmospheres or environments that exceed product ratings.

#### • Mounting

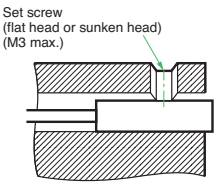
##### Tightening Force

Refer to pages 56 to 59 for the tightening torque to apply when mounting a Fiber Unit.

<Threaded Models>

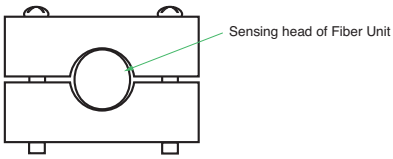



<Cylindrical Models>



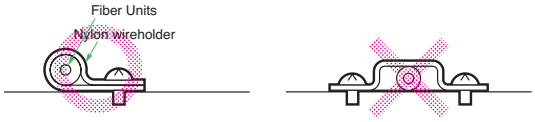

<Chemical and Oil-resistant Models>

The following method is recommended for mounting Fiber Units with fluororesin-covered sensing heads (E32-T F and E32-D F) to prevent from cracking the fluororesin case.
If you use a set screw to secure the Fiber Unit, tighten it with care to prevent from cracking the case.

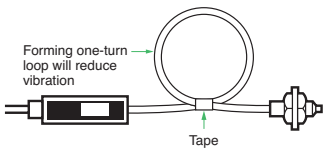



##### Connections

- Do not subject the Fiber Unit to excessive force, such as tension or compression.
  Refer to pages 56 to 59 for tensile strengths.
- Make sure any bend in the Fiber Unit is larger than the allowable bending radius.
  Refer to pages 56 to 59 for bending radius ratings and length of unbendable sections at the base of the Fiber Unit.
- Do not compress or place heavy loads on the fibers.

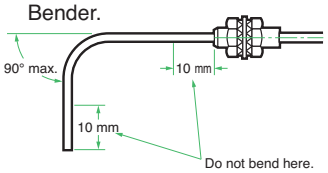


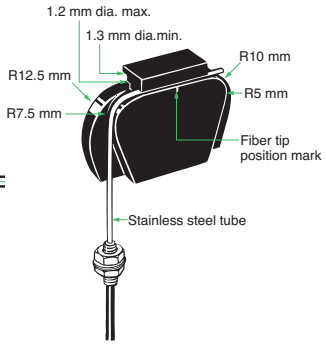

- The method shown below is an effective way to prevent the Fiber Unit from breaking due to vibration.




##### Sleeve Bender (E39-F11)

- The bending radius of the stainless steel tube should be as large as possible. The smaller the bending radius is, the shorter the sensing distance will be.
- Insert the tip of the stainless steel tube in the Sleeve Bender and slowly bend the tube along the curve of the Sleeve Bender.



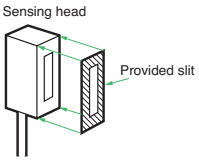

##### Heat-resistant Fiber Units (E32-D51(R) and E32-T51(R))

The fibers of these Units cannot be extended using the E39-F10 Fiber Connector.

##### E32-T14

These Units may enter the light-ON state if there are reflective objects at the end of the lenses.
If reflection is a problem, attach the black stickers provided to the ends of the lenses.

##### E32-T16PR




To use the provided slit, peel off the backing sheet, align the slit with the edges of the sensing surface, and attach it to the sensing head.
Use the slit in applications where saturation occurs (i.e., changes in incident level cannot be detected) due to short sensing distances.

##### Vacuum-resistant Fiber Units (E32-□V)

Although the Flanges, the Fiber Units on the vacuum side, and the Lens Units have been cleaned, as an extra precaution, clean these with alcohol before using them in high-vacuum environments to ensure that they are properly degreased.

##### Liquid-level Detection Fiber Unit (E32-D82F1)

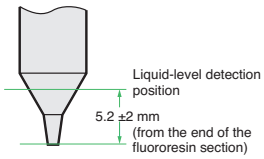
- Secure the Fiber Unit using the unbendable section.
  Otherwise, the liquid-level detection position may be displaced.
- For applications in hazardous environments, install the Fiber Unit in the hazardous environment but install the Amplifier Unit in a safe environment.

##### Liquid-level Detection Fiber Units (Tube-mounting Models)

- Make sure that the tube is not deformed when using a band to secure the Fiber Unit.

## ● Adjustment

### Detection Position for Liquid-level Detection Fiber Unit (E32-D82F1)




The liquid-level detection position is 5.2 ±2 mm from the end of the fluororesin section. (Refer to the diagram on the right.)
The liquid-level detection position varies with the surface tension of the liquid and the degree of wetness at the Fiber Unit's detection position.

## ● Other Precautions

### Liquid-level Detection Fiber Unit (E32-D82F1)

- Operation may become unstable in the following cases:
  1. Bubbles stick to the cone of the sensing head.
  2. Solute deposits on the cone of the sensing head.
  3. The liquid has a high viscosity.
- There are some liquids, such as milky white liquids, for which detection is not possible.
- Do not let the end of the fluororesin section bump into other objects.
  Damage to or deformation of the sensing head may cause unstable operation.

### Chemical and Oil-resistant, Liquid-level Detection Fiber Unit (E32-D82F1)

Fluororesin shows strong chemical-resistant properties but is permeable if exposed to atmospheres with gaseous chemicals or water vapors, resulting in failure or damage.
Confirm applicability sufficiently before using the Fiber Unit in these environments.

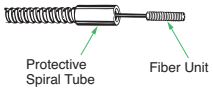
# Accessories

### Use of E39-R3 Reflector Provided with E32-R21

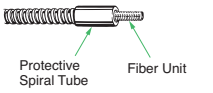
1. Use detergent to remove any dust or oil from the surfaces where tape is applied. Adhesive tape will not be attached properly if oil or dust remains on the surface.
2. The E39-R3 cannot be used in areas that are exposed to oil or chemicals.

### Mounting method of Protective Spiral Tubes

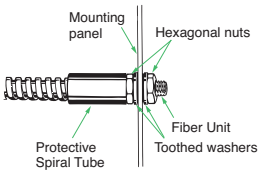
1. Insert the Fiber Unit into the Protective Spiral Tube from the head connector (threaded).



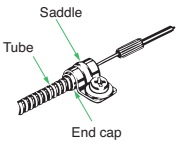

2. Push the fiber into the Protective Spiral Tube. The tube must be straight so that the fiber enters without twisting. Turn the Protective Spiral Tube, not the fiber.




3. Secure the Protective Spiral Tube to the mounting panel with the provided nuts.

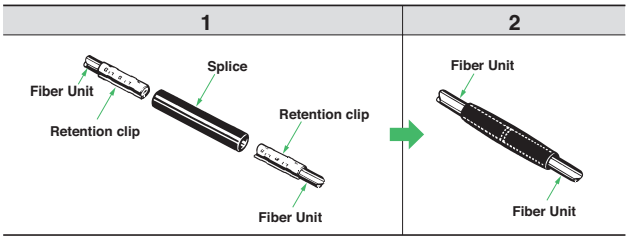



4. Use the provided saddle to secure the end cap of the Protective Spiral Tube.
   (To secure the Protective Spiral Tube at a position other than the end cap, apply tape to the tube so that the portion becomes thicker in diameter.)




### Attaching the E39-F10 Fiber Connector

Attach the Fiber Connecter as shown in the following figures.
1. Insert the Fiber Unit in the retention clip.
2. Insert the retention clip into the splice.




- The Fiber Units should be as close as possible when they are connected.
  The sensing distance is reduced by approximately 25% when Fiber Units are extended by the connector.
- Only 2.2-mm-diameter fibers can be connected.

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## Selection by Model



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| | P.54 | P.55 55-A |
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| | P.54 | P.55 55-B |
| E32-A04 2M | P.28 | P.29 29-C |
| | P.54 | P.55 55-C |
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| E32-D15ZR 2M | P.14 | P.15 15-F |
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| E32-D73-S 2M | P.44 | P.45 45-H |
| E32-D81R-S 2M | P.44 | P.45 45-C |
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| E3X-HD41 2M | P.64 | P.64 64-A |
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**Cat. No. E418-E1-01** CSM_1_1_0212 0212 (0212) (W)

# Mouser Electronics

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