

## Miniature Square Photoelectric Sensor in plastic housing

## E3T

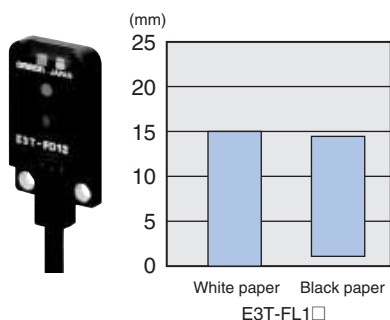
- Precision pinpoint LED
- 3.5 mm thin flat shape or 6.6 mm side view shape where space is crucial
- IP67
- Pulse synchronisation for high ambient light immunity
- Models for mounting with M2 or M3 screws



## Features

3.5 mm flat model with background suppression (BGS) with highest repeatability even for differently coloured objects.

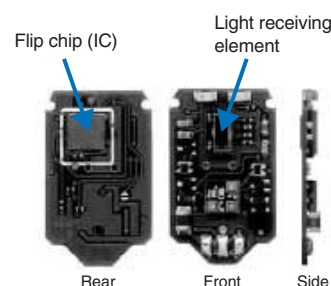
## Minimal black/white error



## Unique light receiving lens shape for high precision alignment

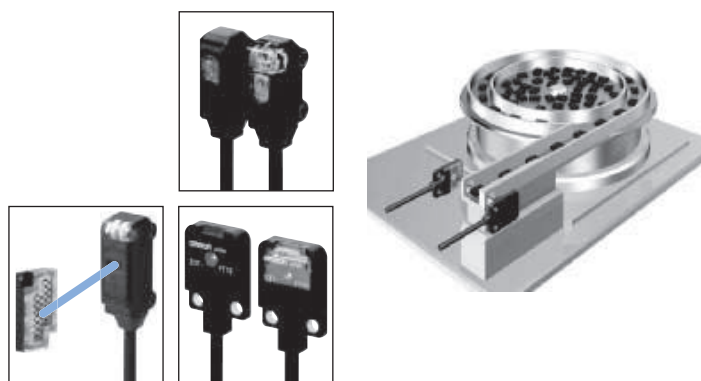


## New mounting technology for reliable background suppression in 3.5 mm flat housing



## Object detection through small holes

- The precision pinpoint LED of the through-beam models provides appropriate sensing distances for very precise and reliable detection even through smallest slits and gaps with e.g. 0.5 mm dia.
- The coaxial optics and the small focal lens of the retro-reflective models allow the detection of small (dia 2 mm) objects or through small holes (dia 2 mm).



## Application

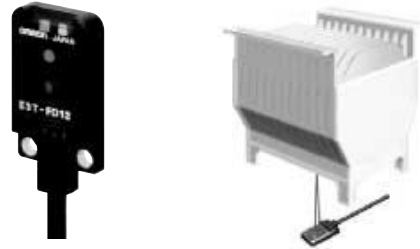
### E3T-SL limited-reflective models (side view)

- Minimum detection object: 0.15 mm dia.
- Limited-reflective optics reduce the influence of changing backgrounds and surrounding metal for enhanced detection stability.



### E3T-FD Diffuse-reflective Models (Flat)

- Minimum detection object: 0.15 mm dia.
- 3.5 mm thickness for installations with limited space.



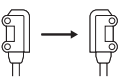
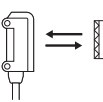
### Models with M2 or M3 mounting holes

- space saving M2 screw mounting (screws included)
- standard M3 screw mounting (order screws sets from accessories)



# Ordering Information

## Sensors

| Sensor type                                                                                                                                 | Sensing distance                                                                                          | Connection method                                                                 |                                                                                   |                                                                                   |                                                                                   | Operation mode | Mounting screw size         | Order code <sup>*1</sup>    |                             |             |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------|-----------------------------|-----------------------------|-----------------------------|-------------|
|                                                                                                                                             |                                                                                                           |  |  |  |  |                |                             | NPN output                  | PNP output                  |             |
| <div>Through-beam</div>                                    | 2 m                                                                                                       | —                                                                                 | —                                                                                 | 2 m                                                                               |                                                                                   | Light-ON       | M2                          | E3T-ST31 2M                 | E3T-ST33 2M                 |             |
|                                                                                                                                             | 1 m                                                                                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Dark-ON        | M2                          | E3T-ST32 2M                 | E3T-ST34 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Light-ON       | M2                          | E3T-ST11 2M                 | E3T-ST13 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                | M3                          | E3T-ST11M 2M                | E3T-ST13M 2M                |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Dark-ON        | M2                          | E3T-ST12 2M                 | E3T-ST14 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                | M3                          | E3T-ST12M 2M                | E3T-ST14M 2M                |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Light-ON       | M2                          | E3T-ST21 2M                 | E3T-ST23 2M                 |             |
|                                                                                                                                             | M3                                                                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                | E3T-ST21M 2M                | E3T-ST23M 2M                |                             |             |
|                                                                                                                                             | Dark-ON                                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | M2             | E3T-ST22 2M                 | E3T-ST24 2M                 |                             |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | M3             | E3T-ST22M 2M                | E3T-ST24M 2M                |                             |             |
|                                                                                                                                             | <div>Through-beam</div>  |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 500 mm         | Light-ON                    | M2                          | E3T-FT11 2M                 | E3T-FT13 2M |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 300 mm         | Dark-ON                     | M2                          | E3T-FT12 2M                 | E3T-FT14 2M |
| Light-ON                                                                                                                                    |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                | M2                          | E3T-FT21 2M                 | E3T-FT23 2M                 |             |
| Dark-ON                                                                                                                                     |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                | M2                          | E3T-FT22 2M                 | E3T-FT24 2M                 |             |
| <div>Retro-reflective</div>                                | 30 to 200 mm <sup>*2</sup><br>on reflectors/<br>10 to 100 mm <sup>*2</sup><br>on reflective foils         |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Light-ON       | M2                          | E3T-SR41-C 2M <sup>*3</sup> | E3T-SR43-C 2M <sup>*3</sup> |             |
|                                                                                                                                             | Dark-ON                                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | M2             | E3T-SR42-C 2M <sup>*3</sup> | E3T-SR44-C 2M <sup>*3</sup> |                             |             |
| <div>Diffuse-reflective</div>                             | 5 to 30 mm                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Light-ON       | M2                          | E3T-FD11 2M                 | E3T-FD13 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | M3             | E3T-FD11M 2M                | E3T-FD13M 2M                |                             |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Dark-ON        | M2                          | E3T-FD12 2M                 | E3T-FD14 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | M3             | E3T-FD12M 2M                | E3T-FD14M 2M                |                             |             |
| <div>Limited-reflective</div>                            | 5 to 15 mm                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Light-ON       | M2                          | E3T-SL11 2M                 | E3T-SL13 2M                 |             |
|                                                                                                                                             | 5 to 30 mm                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   | M3             | E3T-SL11M 2M                | E3T-SL13M 2M                |                             |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Dark-ON        | M2                          | E3T-SL12 2M                 | E3T-SL14 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | M3             | E3T-SL12M 2M                | E3T-SL14M 2M                |                             |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Light-ON       | M2                          | E3T-SL21 2M                 | E3T-SL23 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | M3             | E3T-SL21M 2M                | E3T-SL23M 2M                |                             |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Dark-ON        | M2                          | E3T-SL22 2M                 | E3T-SL24 2M                 |             |
|                                                                                                                                             | M3                                                                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   | E3T-SL22M 2M   | E3T-SL24M 2M                |                             |                             |             |
| <div>Diffuse-reflective (back-ground suppression)</div>  | 1 to 15 mm                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Light-ON       | M2                          | E3T-FL11 2M                 | E3T-FL13 2M                 |             |
|                                                                                                                                             | 1 to 30 mm                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Dark-ON        | M2                          | E3T-FL12 2M                 | E3T-FL14 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Light-ON       | M2                          | E3T-FL21 2M                 | E3T-FL23 2M                 |             |
|                                                                                                                                             |                                                                                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   | Dark-ON        | M2                          | E3T-FL22 2M                 | E3T-FL24 2M                 |             |

For ordering pigtail versions replace '2M' of cable types with:  
- M1.J: M12 with 30 cm cable, - M3.J: M8 4-pin with 30 cm cable  
- M5.J: M8 3-pin with 30 cm cable

For ordering pigtail versions replace '2M' of cable types with:  
 - M1J: M12 with 30 cm cable, - M3J: M8 4-pin with 30 cm cable  
 - M5J: M8 3-pin with 30 cm cable

\*1. For pre-wired models with robotic cables add 'R' to the order code (example: E3T-FT21R 2M)

\*2. The distances are measured with reflector E39-R4 and reflective foil E39-R37-CA. For applications with shorter distances between the sensor and the reflector contact your OMRON representative.

\*3. Order reflector separately. Models with included reflectors are available.

## Accessories (Order Separately)

### Slits

| Minimum detectable object (typical) | Sensing distance | Applicable sensor | Quantity | Order code |
|-------------------------------------|------------------|-------------------|----------|------------|
| 0.5mm dia                           | 200 mm           | E3T-ST3           | 2        | E39-S63    |
|                                     | 100 mm           | E3T-ST1           |          |            |
|                                     | 30 mm            | E3T-ST2           |          |            |
| 1mm dia                             | 600 mm           | E3T-ST3           |          |            |
|                                     | 300 mm           | E3T-ST1           |          |            |
|                                     | 100 mm           | E3T-ST2           |          |            |
| 0.5mm dia                           | 50 mm            | E3T-ST1           |          | E39-S64    |
|                                     | 30 mm            | E3T-ST2           |          |            |
| 1mm dia                             | 100 mm           | E3T-ST1           |          | E39-S67A   |
|                                     | 50 mm            | E3T-ST2           |          |            |
| 0.5mm dia                           | 100 mm           | E3T-ST1_M         |          | E39-S67B   |
|                                     | 30 mm            | E3T-ST2_M         |          |            |
| 1mm dia                             | 300 mm           | E3T-ST1_M         |          |            |
|                                     | 100 mm           | E3T-ST2_M         |          |            |

### Mutual Interference Prevention Filters

| Sensing distance | Applicable sensor | Quantity                                   | Order code |
|------------------|-------------------|--------------------------------------------|------------|
| 300 mm           | E3T-ST1_M         | 4 (two for receivers and two for emitters) | E39-S67B   |
| 100 mm           | E3T-ST2_M         |                                            |            |

### Reflectors

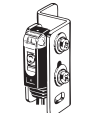
| Shape                                                                               | Type            | Sensing distance*1 | Minimum detectable object (typical) | Remarks                                                                                                                                       | Order code |
|-------------------------------------------------------------------------------------|-----------------|--------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------|
|  | Small reflector | 200 mm (30 mm)     | 2 mm dia                            | Reflectors E39-_-CA are optimised for operation with E3T-SR4. Please verify the performance when using other reflectors and reflective tapes. | E39-R4     |
|  |                 | 100 mm (10 mm)     |                                     |                                                                                                                                               | E39-R37-CA |
|  | Tape reflector  | 100 mm (10 mm)     |                                     |                                                                                                                                               | E39-RS1-CA |
|  |                 | 100 mm (10 mm)     |                                     |                                                                                                                                               | E39-RS2-CA |
|  |                 | 100 mm (10 mm)     |                                     |                                                                                                                                               | E39-RS3-CA |

\*1. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

### Sensitivity Adjustment Unit

| Appearance                                                                          | Sensing distance (typical) | Quantity | Remarks                                              | Model   |
|-------------------------------------------------------------------------------------|----------------------------|----------|------------------------------------------------------|---------|
|  | 300 to 800 mm              | 1        | Can be used with the E3T-ST1□<br>Though-beam Models. | E39-E10 |

## Mounting Brackets

| Appearance                                                                          | Quantity | Remarks                                                                                                             | Model                       |
|-------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------|-----------------------------|
|    | 1        | Can be used with the E3T-S□□□<br>Side-view Models.<br>(A securing nut plate is provided with the Mounting Bracket.) | E39-L116                    |
|    |          |                                                                                                                     | E39-L117<br>for M2 mounting |
|    |          |                                                                                                                     | E39-L166<br>for M3 mounting |
|    |          | Can be used with the E3T-F□□□<br>Flat Models.                                                                       | E39-L118                    |
|    |          |                                                                                                                     | E39-L119                    |
|    |          |                                                                                                                     | E39-L120<br>for M2 mounting |
|   |          | Spacer for mounting flat sensors with M3 screws                                                                     | E39-L167<br>for M3 mounting |
|  |          |                                                                                                                     | E39-L168                    |

Note: When using Through-beam models, order one bracket for the Receiver and one for the Emitter.

## Screw Sets

| Type                                   | Comment                                                                                              | Applicable sensor | Quantity | Order code |
|----------------------------------------|------------------------------------------------------------------------------------------------------|-------------------|----------|------------|
| Screw set for M2 side view sensors     | Iron Phillips screws (M2×14),<br>Hexagonal nuts, Spring washers,<br>Flat washers                     | E3T-S             | 2        | E39-L164   |
| Screw set for M2 flat sensors          | Iron Phillips screws (M2×8),<br>Hexagonal nuts, Spring washers,<br>Flat washers                      | E3T-F             |          | E39-L165   |
| SUS Screw set for M2 side view sensors | Stainless steel bolt with hexagonal<br>hole (M2 x 6)                                                 | E3T-S             |          | E39-L172   |
| SUS Screw set for M2 flat sensors      | Stainless steel bolt with hexagonal<br>hole (M2×12), Hexagonal nuts, Spring<br>washers, Flat washers | E3T-F             |          | E39-L173   |
| SUS Screw set for M3 side view sensors | Stainless steel bolt with hexagonal<br>hole (M3 x 6)                                                 | E3T-S_M           |          | E39-L170   |
| SUS Screw set for M3 flat sensors      | Stainless steel bolt with hexagonal<br>hole (M3×15), Hexagonal nuts, Spring<br>washers, Flat washers | E3T-F_M           |          | E39-L171   |

## Rating and Specifications

| Item                                | Through-beam                                                                                                                                                                                                                                                                     |                                    |                                                                                                |                                          | Retro-reflective                                                                                                                                 |                                              | Diffuse-reflective                                                                                                             |                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|                                     | Side-view                                                                                                                                                                                                                                                                        |                                    | Flat                                                                                           |                                          | Side-view                                                                                                                                        |                                              | Flat                                                                                                                           |                                              |
|                                     | NPN                                                                                                                                                                                                                                                                              | PNP                                | NPN                                                                                            | PNP                                      | NPN                                                                                                                                              | PNP                                          | NPN                                                                                                                            | PNP                                          |
|                                     | E3T-ST1_<br>E3T-ST2_<br>E3T-ST3_                                                                                                                                                                                                                                                 | E3T-ST1_<br>E3T-ST2_<br>E3T-ST3_   | E3T-FT1_<br>E3T-FT2_<br>E3T-FT3_                                                               | E3T-FT1_<br>E3T-FT2_<br>E3T-FT3_         | E3T-SR41<br>E3T-SR42<br>E3T-SR43<br>E3T-SR44                                                                                                     | E3T-SR41<br>E3T-SR42<br>E3T-SR43<br>E3T-SR44 | E3T-FD11<br>E3T-FD12<br>E3T-FD13<br>E3T-FD14                                                                                   | E3T-FD11<br>E3T-FD12<br>E3T-FD13<br>E3T-FD14 |
| Sensing distance                    | E3T-ST1□ 1 m<br>E3T-ST2□ 300 mm<br>E3T-ST3□ 2 m                                                                                                                                                                                                                                  | E3T-FT1□ 500 mm<br>E3T-FT2□ 300 mm | 200 mm (30 mm)<br>with E39-R4* <sup>1</sup><br>100 mm (10 mm)<br>with E39-R37-CA* <sup>1</sup> | 5 to 30 mm<br>(50 x 50 mm white paper)   |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Minimum detectable object (typical) | 2 mm dia opaque object (E3T-ST1 and E3T-ST2)<br>3 mm dia opaque object (E3T-ST3)                                                                                                                                                                                                 | 1.3 mm dia opaque object           | 2 mm dia. (sensing distance of 100 mm)                                                         | 0.15 mm dia. (sensing distance of 10 mm) |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Hysteresis (white paper)            | ---                                                                                                                                                                                                                                                                              |                                    |                                                                                                |                                          | 6 mm max.                                                                                                                                        |                                              |                                                                                                                                |                                              |
| Directional angle                   | Emitter: 2° to 20°<br>Receiver: 2° to 70°                                                                                                                                                                                                                                        |                                    | Emitter: 3° to 25°<br>Receiver: 3° min.                                                        |                                          | 2° to 20°                                                                                                                                        |                                              | ---                                                                                                                            |                                              |
| Light source (wavelength)           | Red LED (“Pin-point” LED) λ = 650 nm                                                                                                                                                                                                                                             |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Power supply voltage                | 12 to 24 VDC ±10%, ripple (p-p) 10% max.                                                                                                                                                                                                                                         |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Current consumption                 | Emitter: 10 mA max.<br>Receiver: 20 mA max.                                                                                                                                                                                                                                      |                                    |                                                                                                |                                          | 20 mA max.                                                                                                                                       |                                              |                                                                                                                                |                                              |
| Control output                      | Load power supply voltage: 26.4 VDC max.<br>Load current: 50 mA max.<br>(residual voltage: 2 V max. for load current of 10 to 50 mA, 1 V max. for load current of less than 10 mA)<br>Open collector output<br>Light ON: E3T-□□□1 and E3T-□□□3<br>Dark ON: E3T-□□□2 and E3T-□□□4 |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Protection circuits                 | Power supply and control output reverse polarity protection<br>Output short-circuit protection                                                                                                                                                                                   |                                    |                                                                                                |                                          | Power supply and control output reverse polarity protection<br>Output short-circuit protection, Mutual interference prevention, surge suppressor |                                              | Power supply and control output reverse polarity protection<br>Output short-circuit protection, Mutual interference prevention |                                              |
| Response time                       | Operate or reset: 1 ms max.                                                                                                                                                                                                                                                      |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Ambient illumination                | Incandescent lamp: 5,000 lx max.<br>Sunlight: 10,000 lx max.                                                                                                                                                                                                                     |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Ambient temperature range           | Operating: -25 to 55 °C<br>Storage: -40 to 70 °C (with no icing or condensation)                                                                                                                                                                                                 |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Ambient humidity range              | Operating: 35% to 85%<br>Storage: 35% to 95% (with no condensation)                                                                                                                                                                                                              |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Insulation resistance               | 20 MΩ min. at 500 VDC                                                                                                                                                                                                                                                            |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Dielectric strength                 | 1,000 VAC, 50/60 Hz for 1 min                                                                                                                                                                                                                                                    |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Vibration resistance                | Destruction: 10 to 2,000 Hz, 1.5 mm double amplitude or 300 m/s <sup>2</sup> for 0.5 hrs each in X, Y, and Z directions                                                                                                                                                          |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Shock resistance                    | Destruction: 1,000 m/s <sup>2</sup> 3 times each in X, Y, and Z directions                                                                                                                                                                                                       |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Degree of protection                | IP67 (IEC60529)                                                                                                                                                                                                                                                                  |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Connection method                   | Pre-wired (standard length: 2 m)                                                                                                                                                                                                                                                 |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
| Weight                              | Approx. 40 g                                                                                                                                                                                                                                                                     |                                    |                                                                                                |                                          | Approx. 20 g                                                                                                                                     |                                              |                                                                                                                                |                                              |
| Materials                           | Case                                                                                                                                                                                                                                                                             | PBT (polybutylene terephthalate)   |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
|                                     | Display window                                                                                                                                                                                                                                                                   | Denatured polyarylate              |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |
|                                     | Lens                                                                                                                                                                                                                                                                             | Denatured polyarylate              |                                                                                                |                                          | Methacrylic resin                                                                                                                                |                                              | Denatured polyarylate                                                                                                          |                                              |
| Accessories                         | Instruction manual, (screw set E39-L164 for E3T-ST (2 sets) and E3T-SR (1 set); screw set E39-L165 for E3T-FT (2 sets) and E3T-FS (1 set). For E3T-_M order screw sets separately)                                                                                               |                                    |                                                                                                |                                          |                                                                                                                                                  |                                              |                                                                                                                                |                                              |

\*1. Values in parentheses indicate the minimum required distance between Sensor and Reflector.

| Item                                |                | Limited-reflective                                                                                                                                                                                                                                                            |                      |                                        |                      | Diffuse-reflective (background suppression)                  |                      |                                        |                      |
|-------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------|----------------------|--------------------------------------------------------------|----------------------|----------------------------------------|----------------------|
|                                     |                | Side-view                                                                                                                                                                                                                                                                     |                      |                                        |                      | Flat                                                         |                      |                                        |                      |
|                                     |                | NPN                                                                                                                                                                                                                                                                           | PNP                  | NPN                                    | PNP                  | NPN                                                          | PNP                  | NPN                                    | PNP                  |
|                                     |                | E3T-SL11<br>E3T-SL12                                                                                                                                                                                                                                                          | E3T-SL13<br>E3T-SL14 | E3T-SL21<br>E3T-SL22                   | E3T-SL23<br>E3T-SL24 | E3T-FL11<br>E3T-FL12                                         | E3T-FL13<br>E3T-FL14 | E3T-FL21<br>E3T-FL22                   | E3T-FL23<br>E3T-FL24 |
| Sensing distance                    |                | 5 to 15 mm<br>(50 x 50 mm white paper)                                                                                                                                                                                                                                        |                      | 5 to 30 mm<br>(50 x 50 mm white paper) |                      | 1 to 15 mm<br>(50 x 50 mm white paper)                       |                      | 1 to 30 mm<br>(50 x 50 mm white paper) |                      |
| Standard sensing object             |                | ---                                                                                                                                                                                                                                                                           |                      |                                        |                      |                                                              |                      |                                        |                      |
| Minimum detectable object (typical) |                | 0.15 mm dia. (sensing distance of 10 mm)                                                                                                                                                                                                                                      |                      |                                        |                      | 0.15 mm dia non-glossy object<br>(sensing distance of 10 mm) |                      |                                        |                      |
| Hysteresis (white paper)            |                | 2 mm max.                                                                                                                                                                                                                                                                     |                      | 6 mm max.                              |                      | 0.5 mm max.                                                  |                      | 2 mm max.                              |                      |
| Black/white error                   |                | ---                                                                                                                                                                                                                                                                           |                      |                                        |                      |                                                              |                      | 15% max.                               |                      |
| Directional angle                   |                | ---                                                                                                                                                                                                                                                                           |                      |                                        |                      |                                                              |                      |                                        |                      |
| Light source (wavelength)           |                | Red LED (“Pin-point” LED) λ = 650 nm                                                                                                                                                                                                                                          |                      |                                        |                      |                                                              |                      |                                        |                      |
| Power supply voltage                |                | 12 to 24 VDC ±10%, ripple (p-p) 10% max.                                                                                                                                                                                                                                      |                      |                                        |                      |                                                              |                      |                                        |                      |
| Current consumption                 |                | 20 mA max.                                                                                                                                                                                                                                                                    |                      |                                        |                      |                                                              |                      |                                        |                      |
| Control output                      |                | Load power supply voltage: 26.4 VDC max.<br>Load current: 50 mA max. (residual voltage: 2 V max. for load current of 10 to 50 mA, 1 V max. for load current of less than 10 mA)<br>Open-collector output<br>Light ON: E3T-□□□1 and E3T-□□□3<br>Dark ON: E3T-□□□2 and E3T-□□□4 |                      |                                        |                      |                                                              |                      |                                        |                      |
| Protection circuits                 |                | Power supply and control output reverse polarity protection<br>Output short-circuit protection, Mutual interference prevention                                                                                                                                                |                      |                                        |                      |                                                              |                      |                                        |                      |
| Response time                       |                | Operate or reset: 1 ms max.                                                                                                                                                                                                                                                   |                      |                                        |                      |                                                              |                      |                                        |                      |
| Ambient illumination                |                | Incandescent lamp: 5,000 lx max.<br>Sunlight: 10,000 lx max.                                                                                                                                                                                                                  |                      |                                        |                      |                                                              |                      |                                        |                      |
| Ambient temperature range           |                | Operating: -25 to 55 °C<br>Storage: -40 to 70 °C (with no icing or condensation)                                                                                                                                                                                              |                      |                                        |                      |                                                              |                      |                                        |                      |
| Ambient humidity range              |                | Operating: 35% to 85%<br>Storage: 35% to 95% (with no condensation)                                                                                                                                                                                                           |                      |                                        |                      |                                                              |                      |                                        |                      |
| Insulation resistance               |                | 20 MΩ min. at 500 VDC                                                                                                                                                                                                                                                         |                      |                                        |                      |                                                              |                      |                                        |                      |
| Dielectric strength                 |                | 1,000 VAC, 50/60 Hz for 1 min                                                                                                                                                                                                                                                 |                      |                                        |                      |                                                              |                      |                                        |                      |
| Vibration resistance                |                | Destruction: 10 to 2,000 Hz, 1.5 mm double amplitude or 300 m/s <sup>2</sup> for 0.5 hrs each in X, Y, and Z directions                                                                                                                                                       |                      |                                        |                      |                                                              |                      |                                        |                      |
| Shock resistance                    |                | Destruction: 1,000 m/s <sup>2</sup> 3 times each in X, Y, and Z directions                                                                                                                                                                                                    |                      |                                        |                      |                                                              |                      |                                        |                      |
| Degree of protection                |                | IP67 (IEC60529)                                                                                                                                                                                                                                                               |                      |                                        |                      |                                                              |                      |                                        |                      |
| Connection method                   |                | Pre-wired (standard length: 2 m)                                                                                                                                                                                                                                              |                      |                                        |                      |                                                              |                      |                                        |                      |
| Weight                              |                | Approx. 20 g                                                                                                                                                                                                                                                                  |                      |                                        |                      |                                                              |                      |                                        |                      |
| Materials                           | Case           | PBT (polybutylene terephthalate)                                                                                                                                                                                                                                              |                      |                                        |                      |                                                              |                      |                                        |                      |
|                                     | Display window | Denatured polyarylate                                                                                                                                                                                                                                                         |                      |                                        |                      |                                                              |                      |                                        |                      |
|                                     | Lens           | Denatured polyarylate                                                                                                                                                                                                                                                         |                      |                                        |                      |                                                              |                      |                                        |                      |
| Accessories                         |                | Instruction manual, (screw set E39-L164 for E3T-SL (1 set); screw set E39-L165 for E3T-FL (1 set). For E3T-_M order screw sets separately)                                                                                                                                    |                      |                                        |                      |                                                              |                      |                                        |                      |

# Engineering Data (Typical)

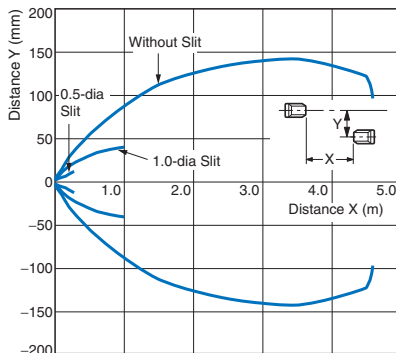
## M2-mounting and M3-mounting Sensors

### Parallel Operating Range

#### Through-beam

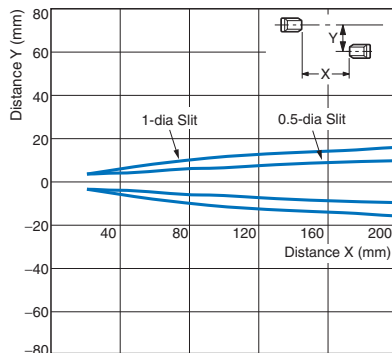
##### E3T-ST3□ + E39-S63 Slit

(A Slit is mounted to the Emitter and Receiver.)



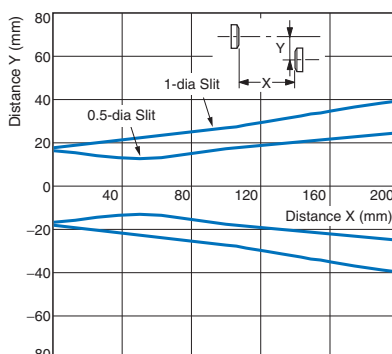
##### E3T-ST1□(M) + E39-S63 Slit (Enlarged graph)

(A Slit is mounted to the Emitter and Receiver.)



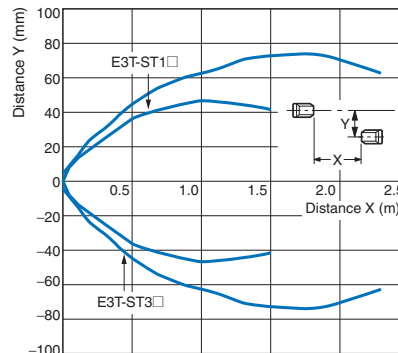
##### E3T-ST2□(M) + E39-S63 Slit (Enlarged graph)

(A Slit is mounted to the Emitter and Receiver.)



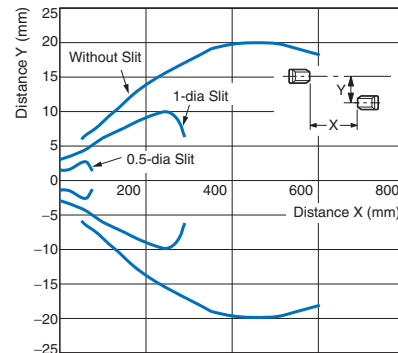
##### E3T-ST□□ + E39-E14 Mutual interference prevention filter

(A Slit is mounted to the Emitter and Receiver.)



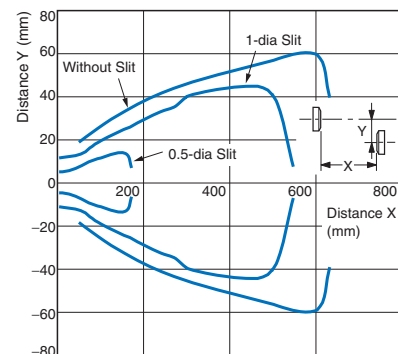
##### E3T-ST2□(M) + E39-S63 Slit

(A Slit is mounted to the Emitter and Receiver.)



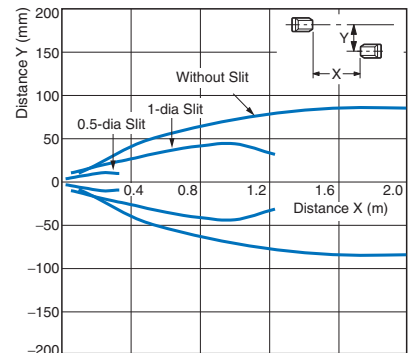
##### E3T-F2□ + E39-S64 Slit

(A Slit is mounted to the Emitter and Receiver.)



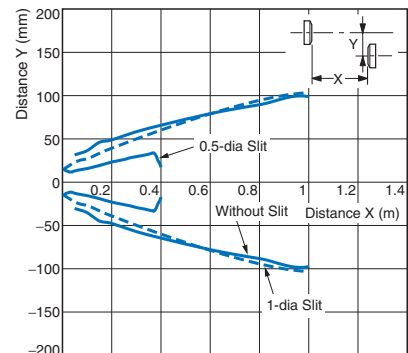
##### E3T-ST1□(M) + E39-S63 Slit

(A Slit is mounted to the Emitter and Receiver.)



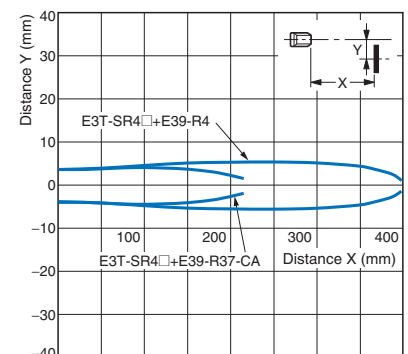
##### E3T-F1□ + E39-S64 Slit

(A Slit is mounted to the Emitter and Receiver.)



### Retro-reflective

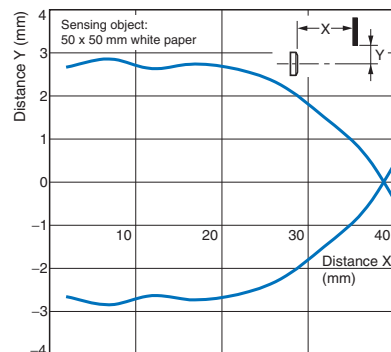
#### E3T-SR4□



### Operating Range

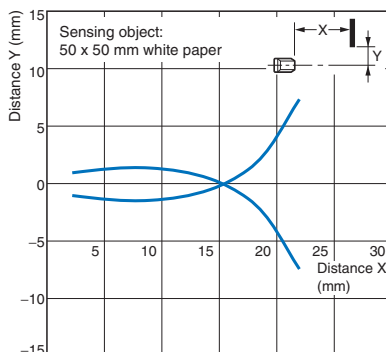
#### Diffuse-reflective

##### E3T-FD1□(M)

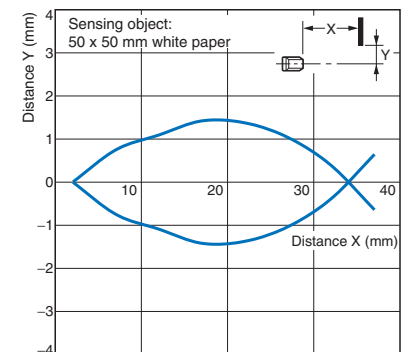


#### Convergent-reflective

##### E3T-SL1□(M)

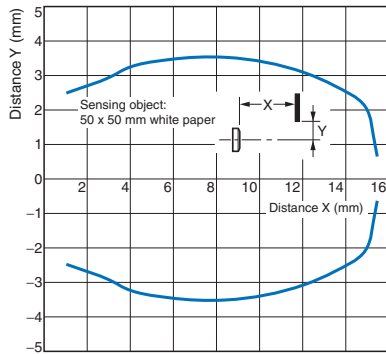


##### E3T-SL2□(M)

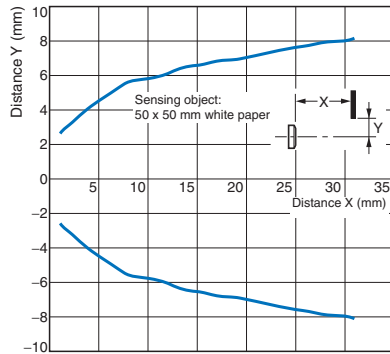




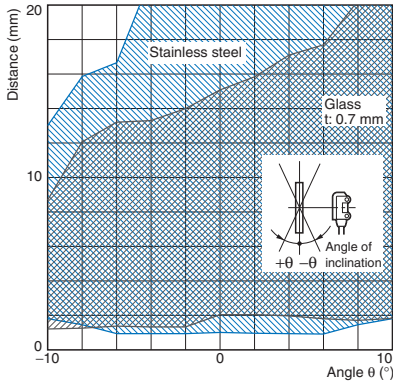
**BGS-reflective**  
**E3T-FL1□**



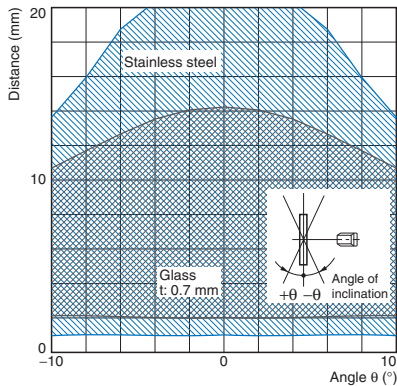
**E3T-FL2□**



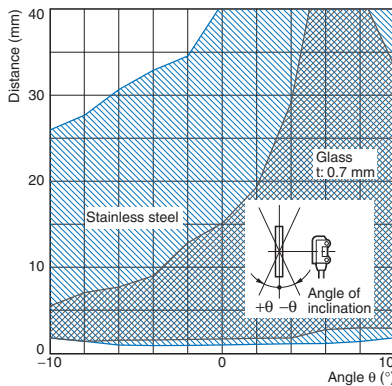
**Inclination Detection Area Characteristic**  
**Convergent-reflective**  
**E3T-SL1□(M) (Top to Bottom)**



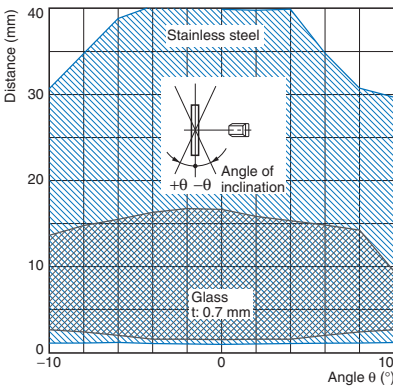
**E3T-SL1□(M) (Right to Left)**



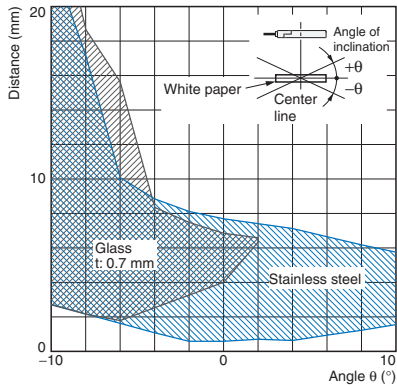
**E3T-SL2□(M) (Top to Bottom)**



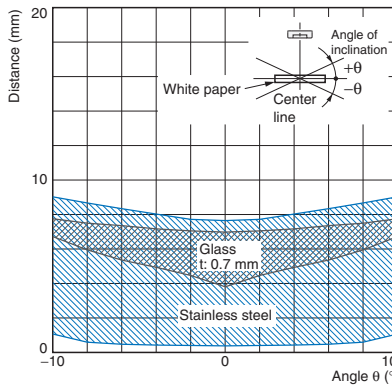
**E3T-SL2□(M) (Right to Left)**



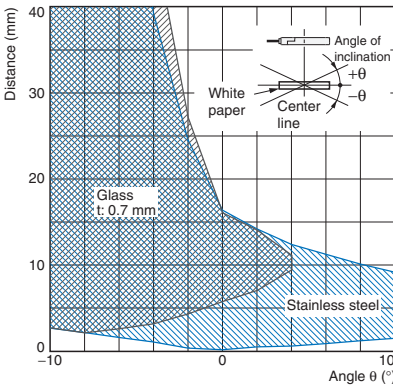
**BGS-reflective**  
**E3T-FL1□ (Top to Bottom)**



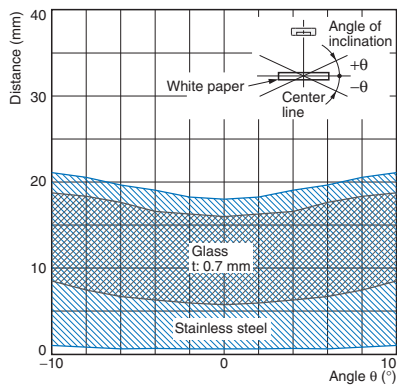
**E3T-FL1□ (Right to Left)**



**E3T-FL2□ (Top to Bottom)**



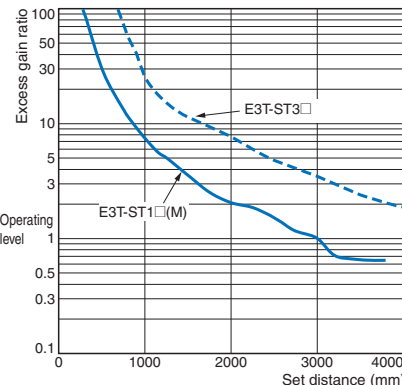
**E3T-FL2□ (Right to Left)**



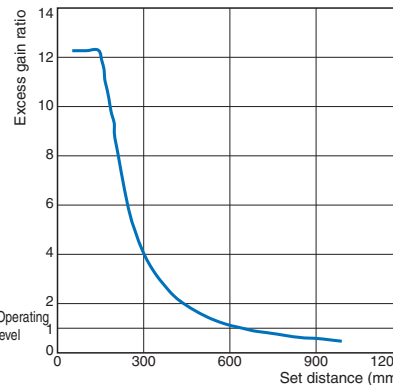
**Excess Gain vs. Set Distance**

**Through-beam**

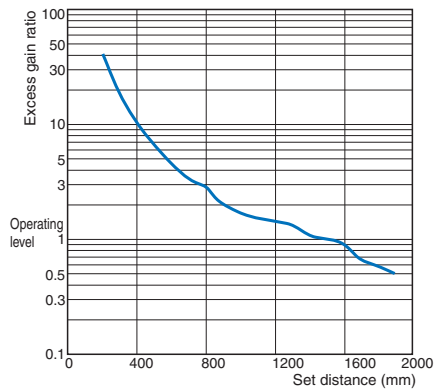
**E3T-ST1□(M)/E3T-ST3□**



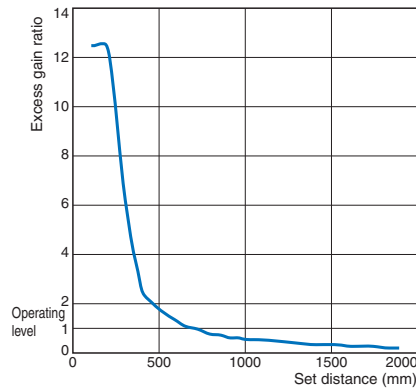
**E3T-ST2□(M)**



### E3T-FT1□

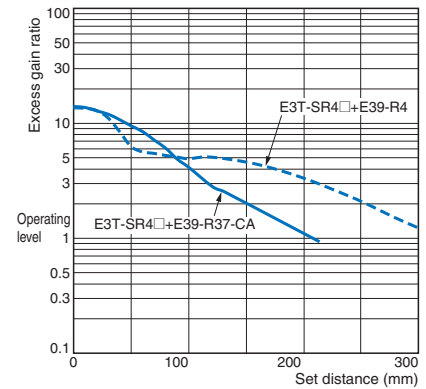


### E3T-FT2□



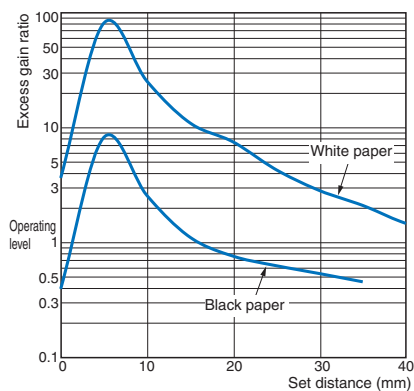
### Retro-reflective

#### E3T-SR4□



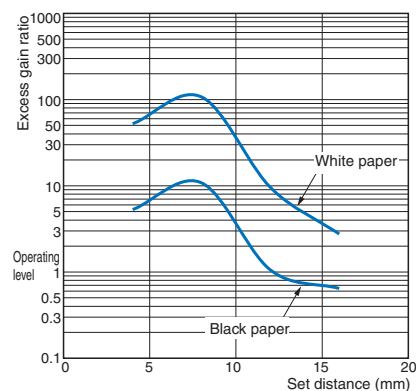
### Diffuse-reflective

#### E3T-FD1□(M)

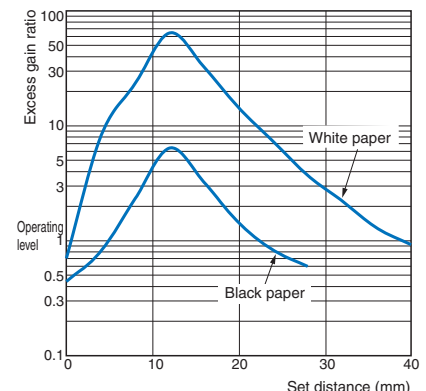


### Convergent-reflective

#### E3T-SL1□(M)



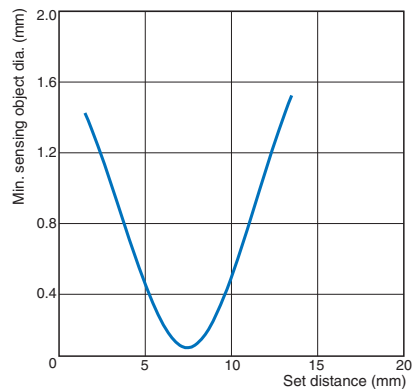
#### E3T-SL2□(M)



### Sensing Object Size vs. Sensing Distance

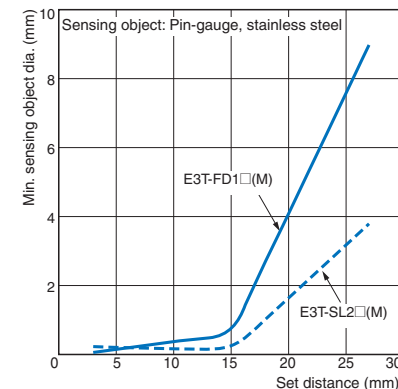
#### Convergent-reflective

##### E3T-SL1□(M)



#### Diffuse/Convergent-reflective

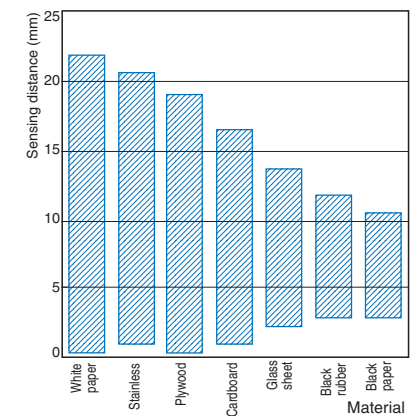
##### E3T-FD1□(M)/E3T-SL2□(M)



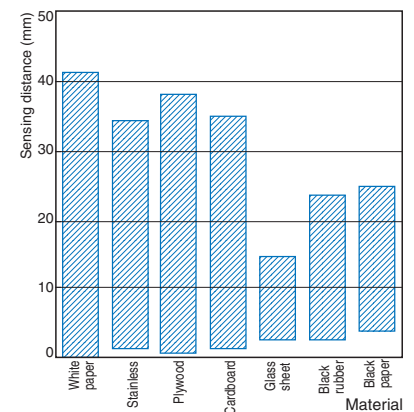
### Sensing Distance vs. Material

#### Convergent-reflective

##### E3T-SL1□(M)

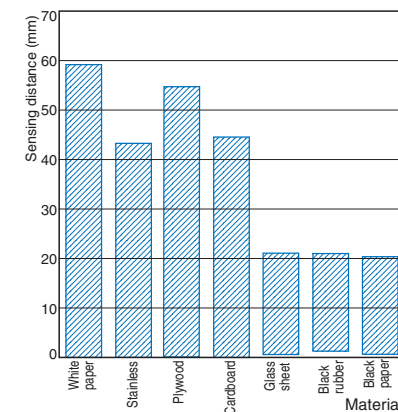


#### E3T-SL2□(M)



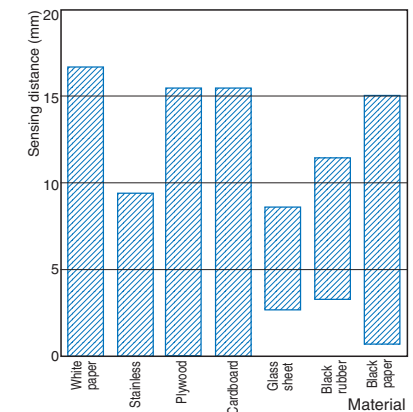
#### Diffuse-reflective

##### E3T-FD1□(M)



#### BGS-reflective

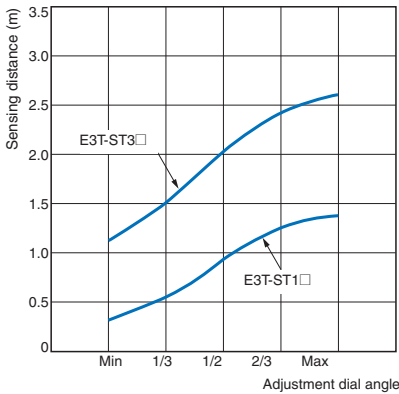
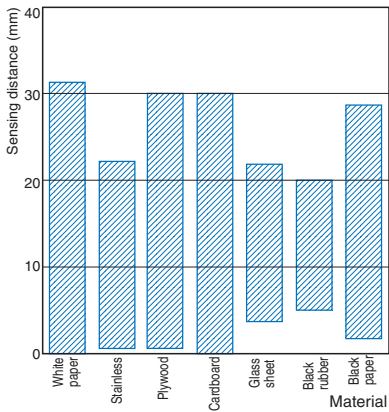
##### E3T-FL1□



# Sensing Distance Characteristics of Sensitivity Adjustment Unit (when Completing Optical Axis Adjustment)

E3T-ST1□ + E39-E10 Sensitivity Adjustment Unit  
E3T-ST3□ + E39-E10 Sensitivity Adjustment Unit

E3T-FL2□



## I/O Circuit Diagrams

### NPN Output

| Model             | Operation mode | Timing charts                                                                                                                                                                                                                                                                                                  | Output circuit                                                                                                                                                                                                                           |
|-------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E3T-_1<br>E3T-_1M | Light-ON       | <p>Light incident: [High pulse]</p> <p>Light interrupted: [Low pulse]</p> <p>Operation indicator (orange): ON [High pulse], OFF [Low pulse]</p> <p>Output transistor: ON [High pulse], OFF [Low pulse]</p> <p>Load (e.g., relay): Operate [High pulse], Reset [Low pulse]</p> <p>(Between brown and black)</p> | <p>Through-beam Receivers, Retroreflective and Reflective Models</p> <p>Operation indicator (Orange), Stability indicator (Green), Photo-electric Sensor Main Circuit, (Control output), Load (Relay), 12 to 24 VDC, 50 mA max., 0 V</p> |
| E3T-_2<br>E3T-_2M | Dark-ON        | <p>Light incident: [High pulse]</p> <p>Light interrupted: [Low pulse]</p> <p>Operation indicator (orange): ON [Low pulse], OFF [High pulse]</p> <p>Output transistor: ON [Low pulse], OFF [High pulse]</p> <p>Load (e.g., relay): Operate [Low pulse], Reset [High pulse]</p> <p>(Between brown and black)</p> | <p>Through-beam Emitters</p> <p>Photo-electric Sensor Main Circuit, 12 to 24 VDC</p>                                                                                                                                                     |

### PNP Output

| Model             | Operation mode | Timing charts                                                                                                                                                                                                                                                                                                       | Output circuit                                                                                                                                                                                                                           |
|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E3T-_3<br>E3T-_3M | Light-ON       | <p>Light incident: [High pulse]</p> <p>Light interrupted: [Low pulse]</p> <p>Operation indicator (orange): ON [High pulse], OFF [Low pulse]</p> <p>Output transistor: ON [High pulse], OFF [Low pulse]</p> <p>Load (e.g., relay): Operate [High pulse], Reset [Low pulse]</p> <p>(Between blue and black leads)</p> | <p>Through-beam Receivers, Retroreflective and Reflective Models</p> <p>Operation indicator (Orange), Stability indicator (Green), Photo-electric Sensor Main Circuit, (Control output), Load (Relay), 12 to 24 VDC, 50 mA max., 0 V</p> |
| E3T-_4<br>E3T-_4M | Dark-ON        | <p>Light incident: [High pulse]</p> <p>Light interrupted: [Low pulse]</p> <p>Operation indicator (orange): ON [Low pulse], OFF [High pulse]</p> <p>Output transistor: ON [Low pulse], OFF [High pulse]</p> <p>Load (e.g., relay): Operate [Low pulse], Reset [High pulse]</p> <p>(Between blue and black leads)</p> | <p>Through-beam Emitters</p> <p>Photo-electric Sensor Main Circuit, 12 to 24 VDC</p>                                                                                                                                                     |

## Safety Precautions

Refer to *Warranty and Limitations of Liability*.

### WARNING

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



Do not apply AC power to the E3T, otherwise the E3T may rupture.



### Precautions for Correct Use

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

#### Wiring

The maximum power supply voltage is 26.4 VDC. Before turning the power ON, make sure that the power supply voltage be not more than maximum voltage.

#### Load short-circuit protection

The E3T incorporates a load short-circuit protection function. If the load short-circuits, the output of the E3T will be turned OFF. Then, recheck the wiring and turn on the E3T again to reset the load short-circuit protection function. The load short-circuit protection function will work if there is a current flow that is 1.5 times larger than the rated load current. When using a capacitance load, be sure that the inrush current will not exceed 1.5 times larger than the rated current.

#### Mounting

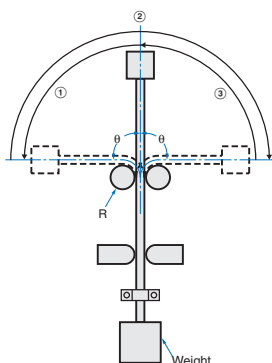
When mounting the Sensor, never strike it with a heavy object, such as a hammer. Doing so may reduce its watertight properties. Use screws with spring, flat, or toothed washers to secure the Sensor. Tightening Torque

M2-mounting Sensors: 0.15 N·m max

M3-mounting Sensors: 0.5 N·m max

#### Mounting the Sensor on Moving Parts

Consider models that use break resistant cables (e.g., Robotics Cables) if the Sensor will be mounted on a moving part, such as a robot hand. The flexing resistance of Robotics Cable at approximately 400 thousand times is far superior to that of standard cable at approximately 14 thousand times.



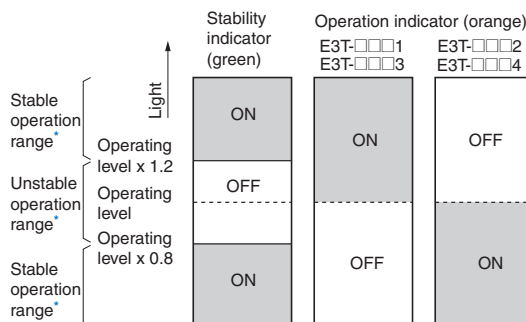
#### Cable Bending Rupture Test (Tough Cable Breaking Test)

The cable is repeatedly bent with power supplied to check the number of bends until the current is turned OFF.

| Specimen |                                       | Standard cable<br>2.4-mm dia.<br>(7/0.127-mm dia.),<br>3 conductors | Robotics cable<br>2.4-mm dia.<br>(20/0.08-mm dia.),<br>3 conductors |
|----------|---------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| Test     | Bending angle (θ)                     | 90° each to the left and right                                      |                                                                     |
|          | Bending speed                         | 50 times/min                                                        |                                                                     |
|          | Load                                  | 200 g                                                               |                                                                     |
|          | Operation per bend                    | Once in 1 to 3 in the diagram                                       |                                                                     |
|          | Curvature radius of support point (R) | 5 mm                                                                |                                                                     |
| Result   |                                       | Approx. 14,000 times                                                | Approx. 400,000 times                                               |

#### Adjusting Indicators

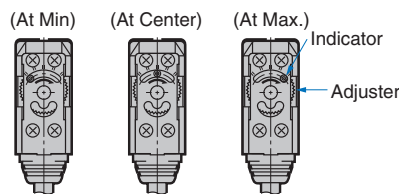
- The following graphs indicate the status of each operating level.
- Be sure to use the E3T within the stable operating range.



\* If the E3T fs operating level is set to the stable operation range, the E3T will be in most reliable operation without being influenced by temperature change, voltage fluctuation, dust, or setting change. If the operating level cannot be set to the stable operation range, pay attention to environmental changes while operating the E3T.

#### Use of E39-E10 Sensitivity Adjustment Unit

(Dark-ON: E3T-ST12)



- Mount the Unit on the Receiver.
- Set the adjuster of the Sensitivity Adjustment Unit to Max. (Before shipping: Max.)
- After mounting on the Sensor, adjust the optical axis and secure the Sensor.
- Place a workpiece between the Emitter and Receiver and gradually turn the adjuster counterclockwise toward the Min. side. Stop turning the adjuster when the operation indicator and stability indicator (green) turn ON.
- Remove the workpiece and confirm that the operation indicator is OFF and the stability indicator (green) is ON. This completes the adjustment.

Note: If the light attenuation rate due to a workpiece is 40% or less, the stability indicator will not turn ON whether or not light is received. When the variation of light is small such as when sensing semi-transparent workpieces, carefully perform preliminary testing.

#### Others

##### Do not install the E3T in the following locations.

- Locations subject to excessive dust or dirt
- Locations subject to direct sunlight
- Locations subject to corrosive gas
- Locations subject to contact with organic solvents
- Locations subject to vibration and shock
- Locations subject to contact with water, oil, or chemicals
- Locations subject to high humidities that might result in condensation

Dimensions

(Unit: mm)

Sensors

Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

M2-mounting Sensors

Through-beam Side-view Sensors

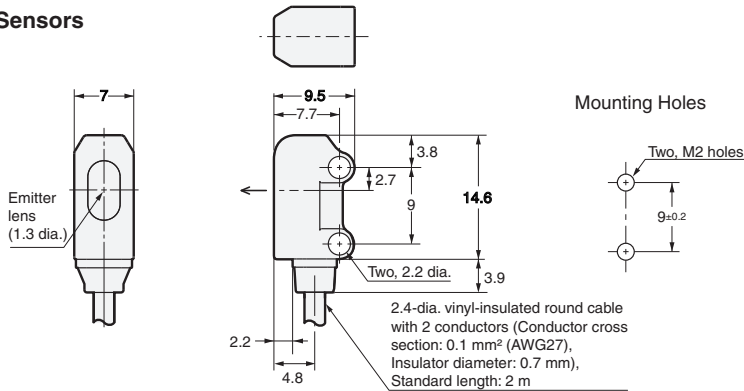
E3T-ST1□ (Emitter)

E3T-ST2□ (Emitter)

E3T-ST3□ (Emitter)



Emitter: E3T-ST□□-L  
Receiver: E3T-ST□□-D



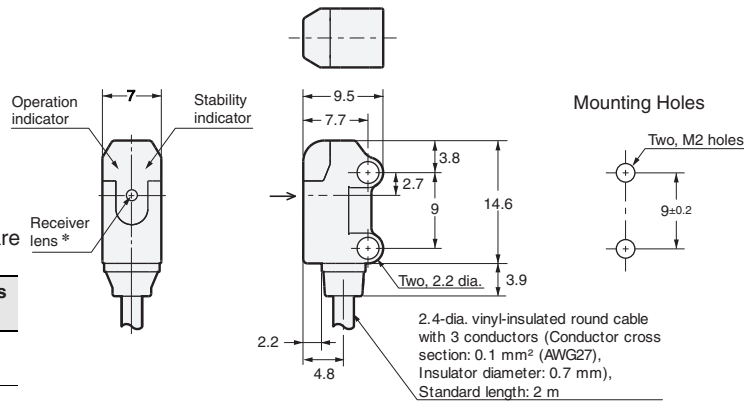
E3T-ST1□ (Receiver)

E3T-ST2□ (Receiver)

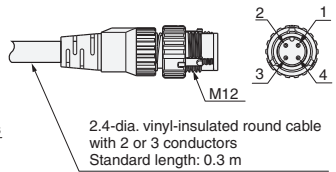
E3T-ST3□ (Receiver)

\*The receiver lens diameters are given below.

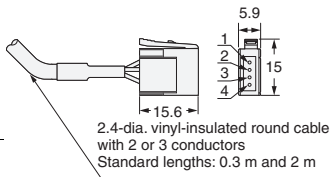
| Model                    | Receiver lens diameter |
|--------------------------|------------------------|
| E3T-ST1□-D<br>E3T-ST2□-D | (1.3 dia.)             |
| E3T-ST3□-D               | (2.4 dia.)             |



M12 Smartclick Pre-wired Connector Model  
(E3T-ST□□-M1TJ/E3T-FT□□-M1TJ)



e-CON Pre-wired Connector Model  
(E3T-ST□□-ECON/E3T-FT□□-ECON)



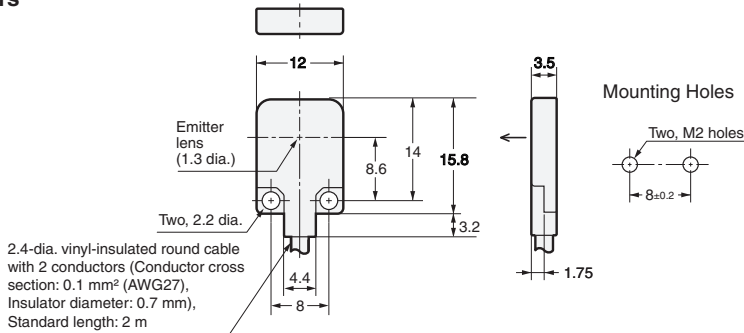
Through-beam Flat Sensors

E3T-FT1□ (Emitter)

E3T-FT2□ (Emitter)



Emitter: E3T-FT□□-L  
Receiver: E3T-FT□□-D

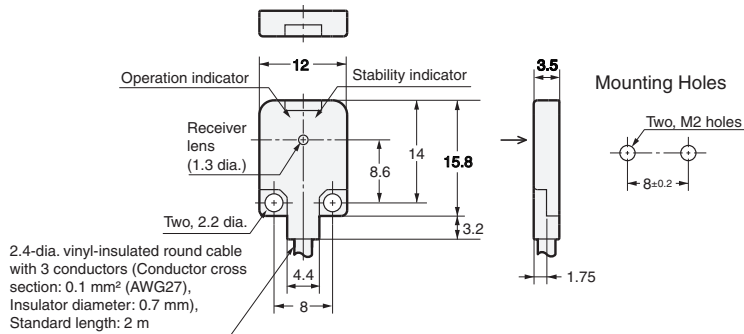


| Terminal No. | Specifications         |
|--------------|------------------------|
| 1            | +V                     |
| 2            | ---                    |
| 3            | 0 V                    |
| 4            | Output (receiver only) |

\* Refer to <Italic>Mounting the Sensor on Moving Parts on page 12 for details on Robotics Cable models.

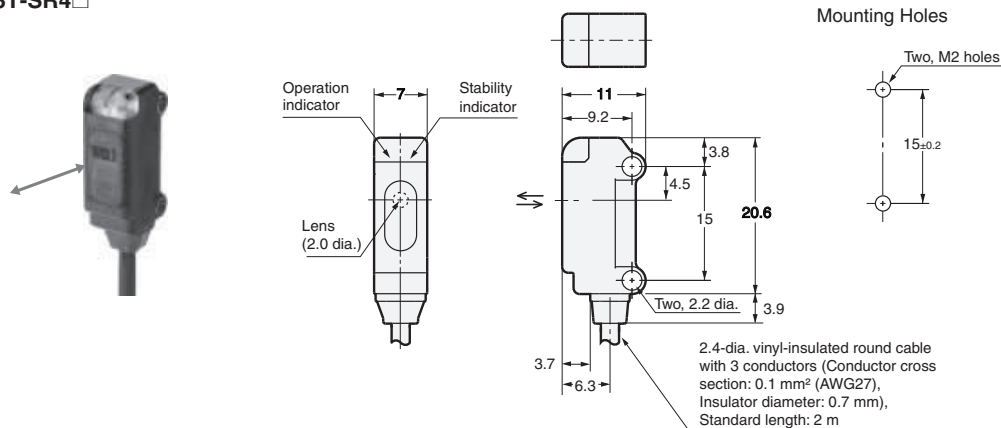
E3T-FT1□ (Receiver)

E3T-FT2□ (Receiver)

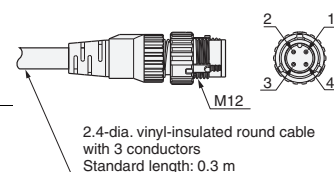


## Retro-reflective Side-view Sensors

### E3T-SR4

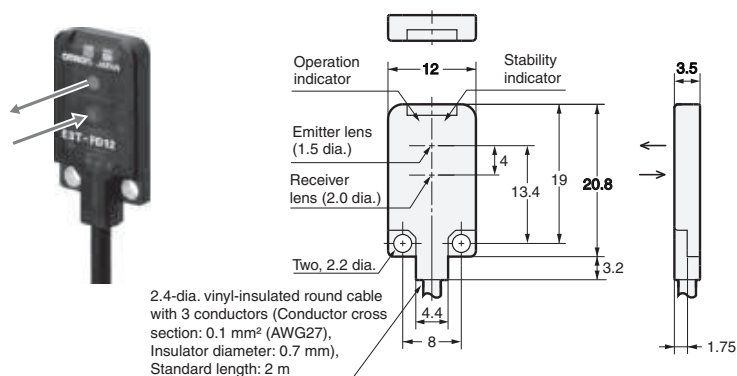


**M12 Smartclick Pre-wired Connector Model**  
(E3T-SR□□-M1TJ/E3T-FD□□-M1TJ/  
E3T-SL□□-M1TJ)

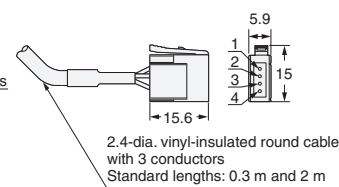


## Diffuse-reflective Flat Sensors

### E3T-FD1



**e-CON Pre-wired Connector**  
(E3T-SR□□-ECON/E3T-FD□□-ECON/  
E3T-SL□□-ECON)

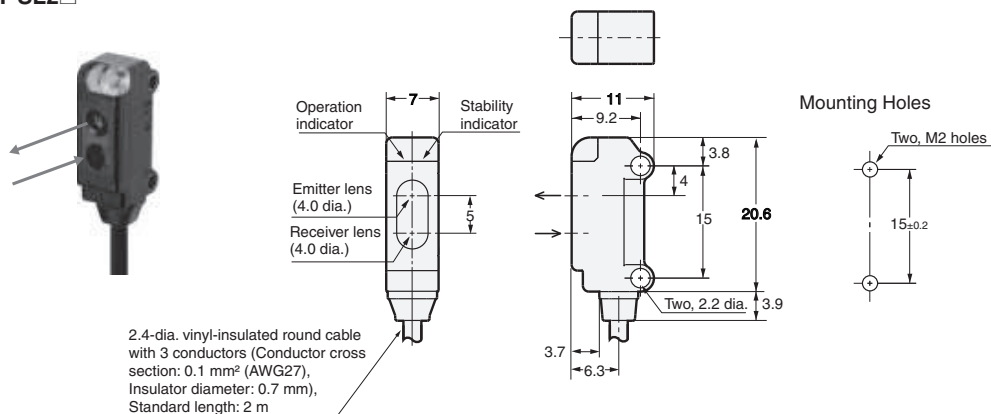


| Terminal No. | Specifications |
|--------------|----------------|
| 1            | +V             |
| 2            | ---            |
| 3            | 0 V            |
| 4            | Output         |

## Convergent-reflective Side-view Sensors

### E3T-SL1

### E3T-SL2



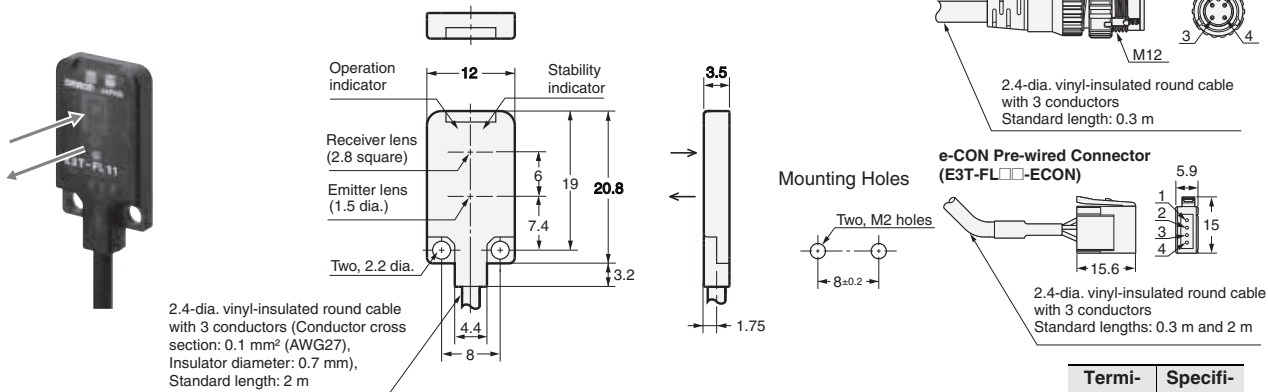
\* Refer to <Italic>Mounting the Sensor on Moving Parts on page 12 for details on Robotics Cable models.



BGS-reflective Flat Sensors

E3T-FL1□

E3T-FL2□



| Terminal No. | Specifications |
|--------------|----------------|
| 1            | +V             |
| 2            | ---            |
| 3            | 0 V            |
| 4            | Output         |

\* Refer to <Italic>Mounting the Sensor on Moving Parts on page 12 for details on Robotics Cable

M3-mounting Sensors

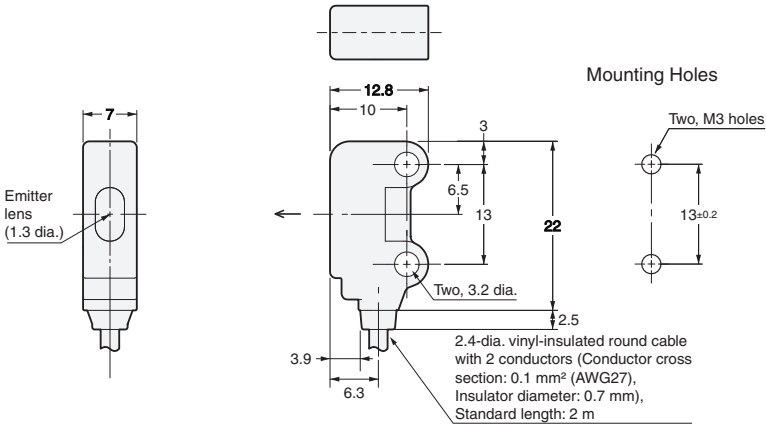
Through-beam Side-view Sensors

E3T-ST1□M (Emitter)

E3T-ST2□M (Emitter)

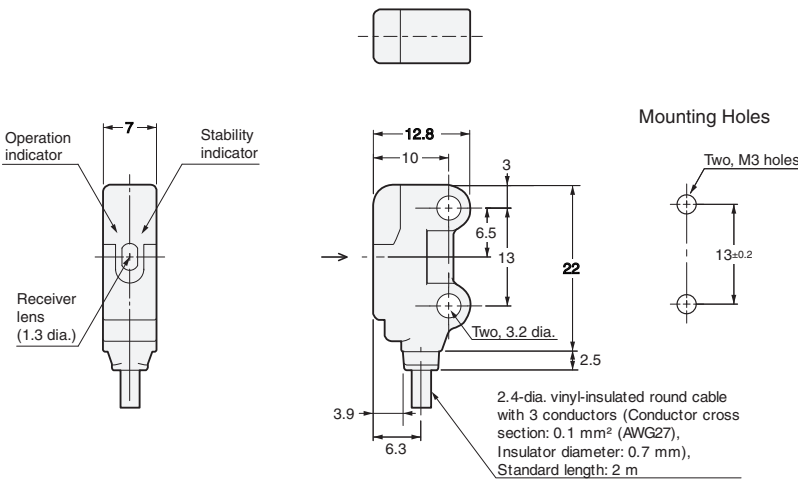


Emitter: E3T-ST□□M-L  
Receiver: E3T-ST□□M-D



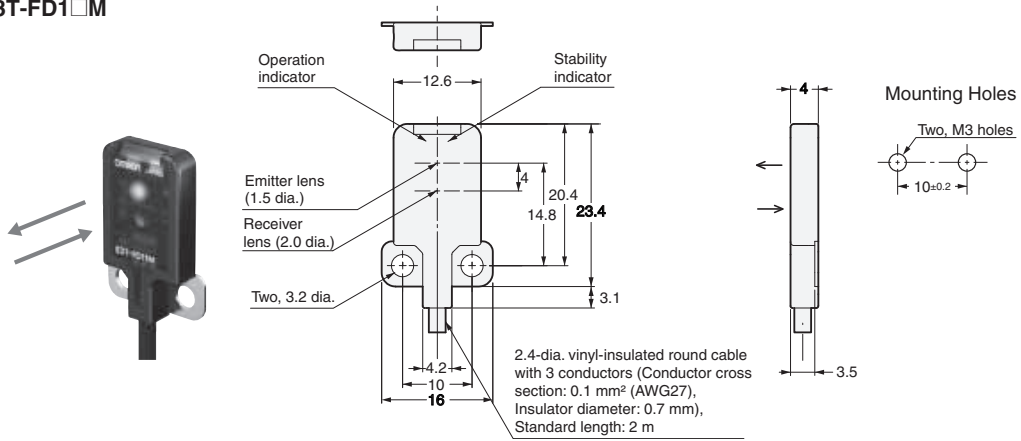
E3T-ST1□M (Receiver)

E3T-ST2□M (Receiver)



## Diffuse-reflective Flat Sensors

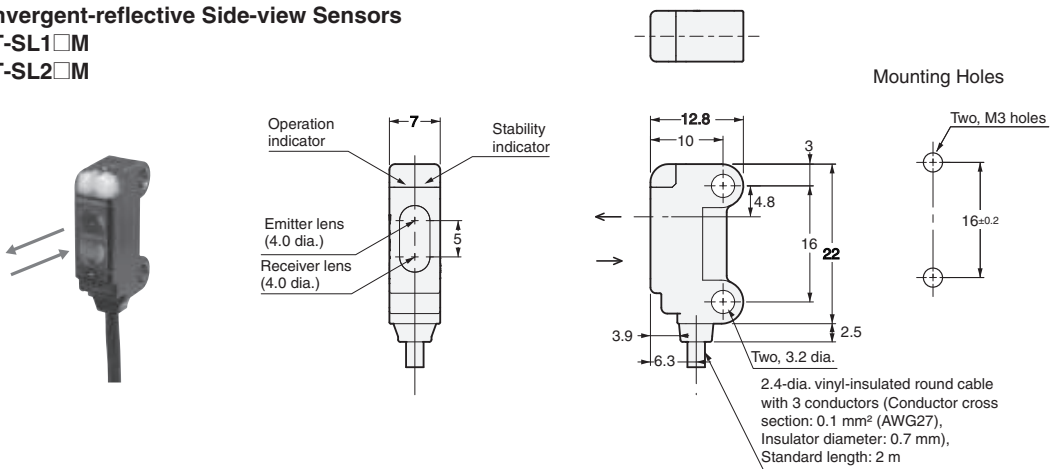
### E3T-FD1□M



## Convergent-reflective Side-view Sensors

### E3T-SL1□M

### E3T-SL2□M

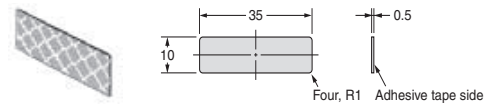




Accessories (Order Separately)

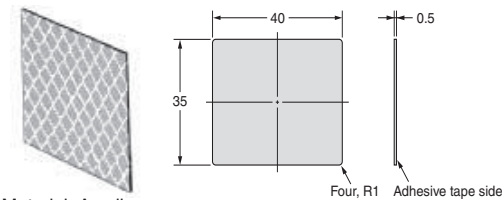
Tape Reflectors

E39-RS1-CA



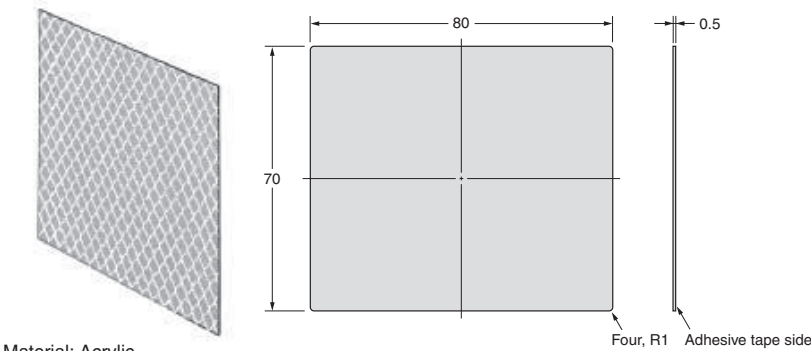
Material: Acrylic

E39-RS2-CA



Material: Acrylic

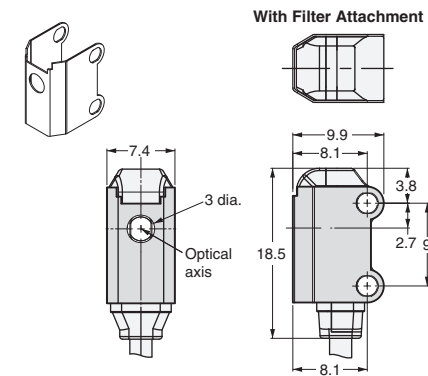
E39-RS3-CA



Material: Acrylic

Mutual Interference Prevention Filter for E3T-ST□□/ST1□ Through-beam Sensors

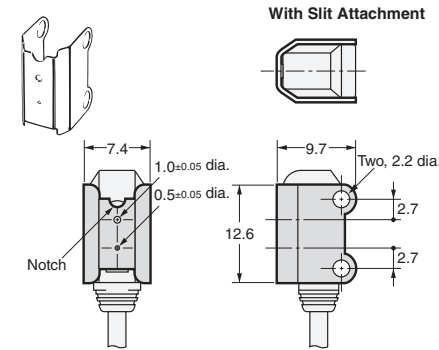
E39-E14



Material: 0.2-mm thick stainless steel (SUS301)

Slit for E3T-ST□□ Through-beam Sensors

E39-S63

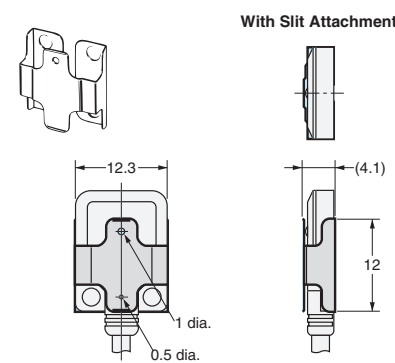


Material: 0.2-mm thick stainless steel (SUS301)

Note: Align the notch direction of the Slit when installing on the Emitter and Receiver.

Slit for E3T-FT□□ Through-beam Sensors

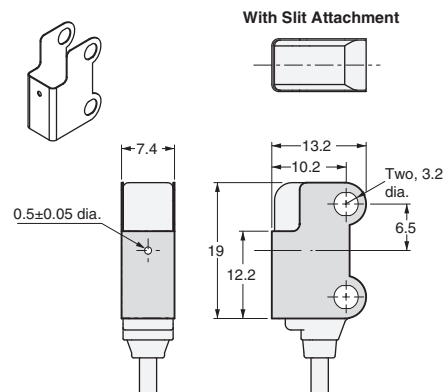
E39-S64



Material: 0.1-mm thick stainless steel (SUS301)

0.5-dia Slit for E3T-ST□□M Through-beam Sensors

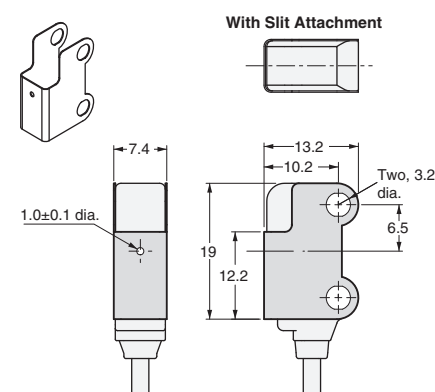
E39-S76A



Material: 0.2-mm thick stainless steel (SUS301)

1-dia Slit for E3T-ST□□M Through-beam Sensors

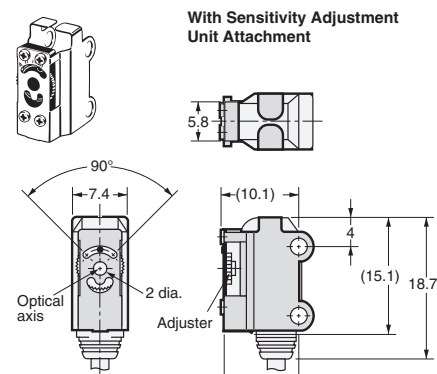
E39-S76B



Material: 0.2-mm thick stainless steel (SUS301)

Sensitivity Adjustment Unit for E3T-ST1□/ST3□ Through-beam Sensors

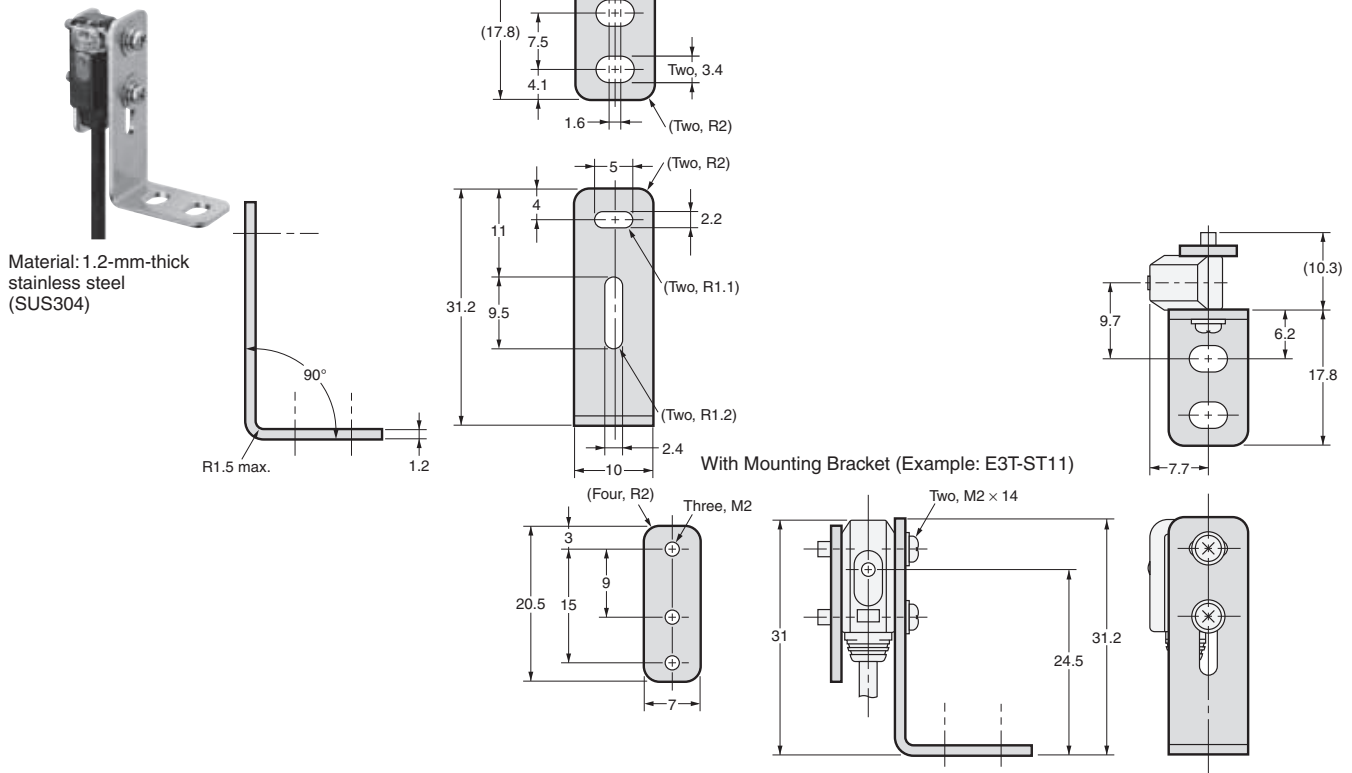
E39-E10



Material: stainless steel (SUS301)

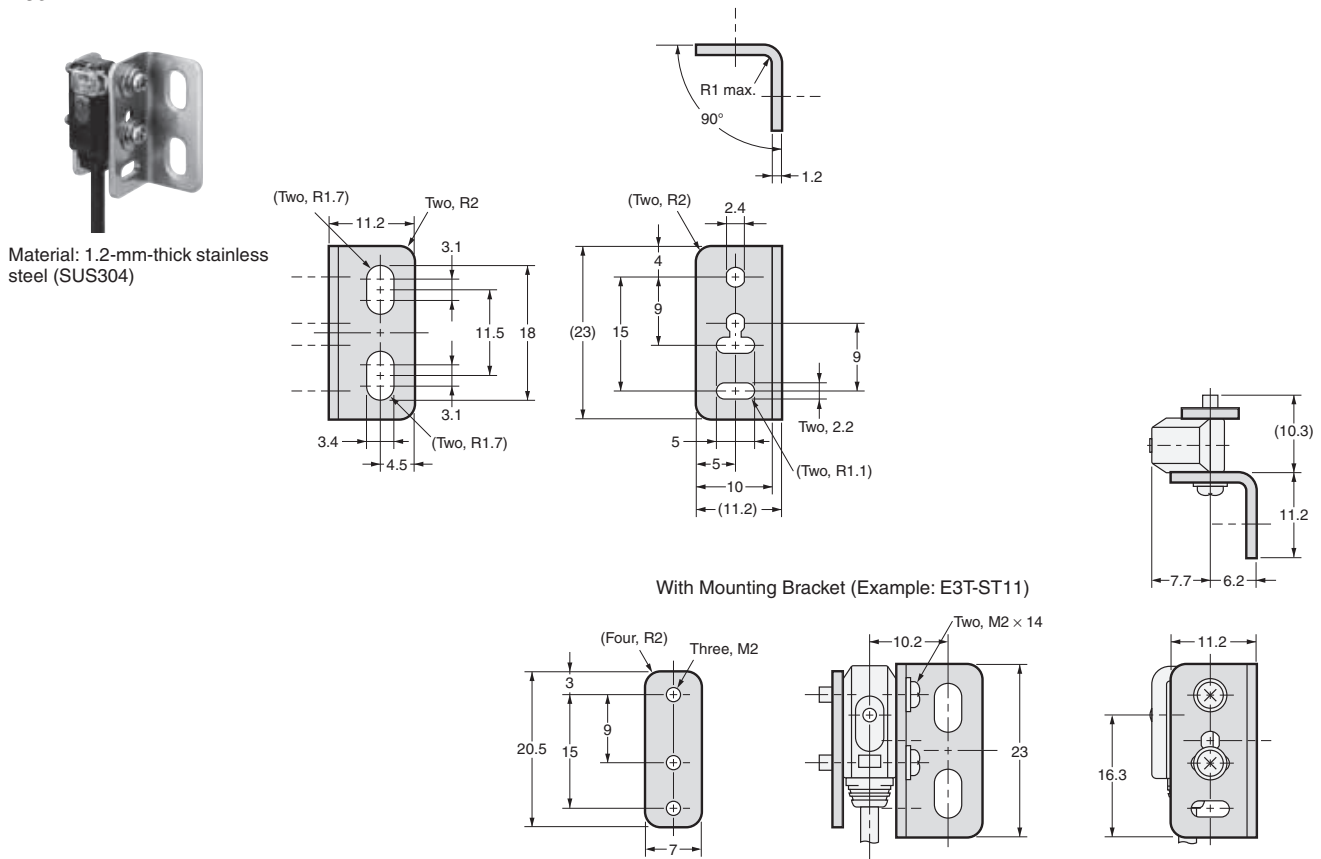
## Mounting Bracket for M2-mounting Side-view Sensors

### E39-L116



## Mounting Bracket for M2-mounting Side-view Sensors

### E39-L117

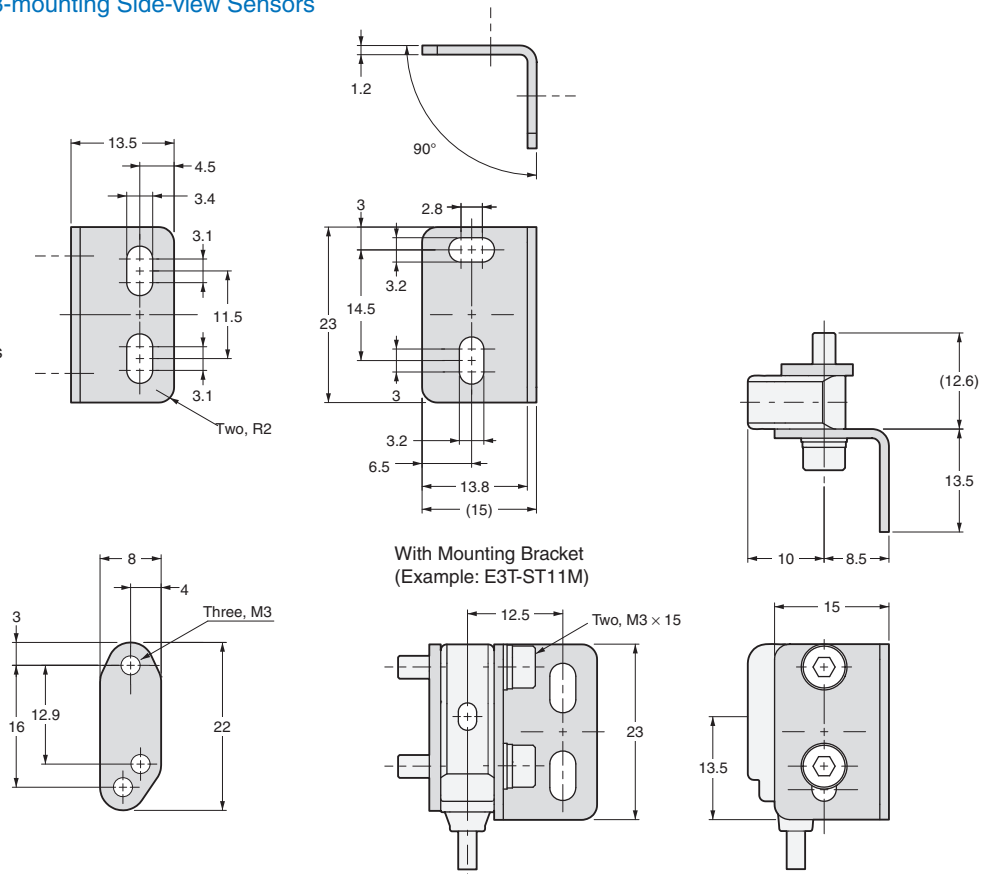




## Mounting Bracket for M3-mounting Side-view Sensors E39-L166



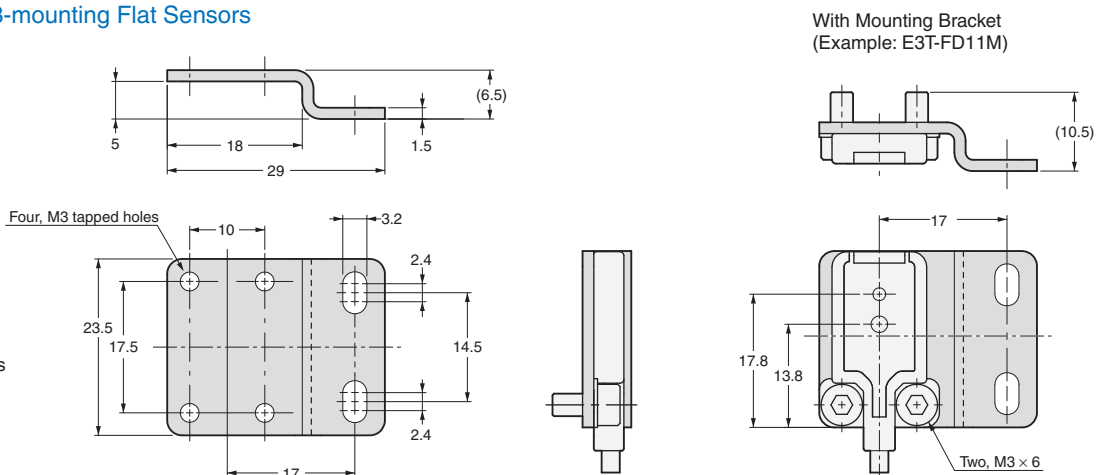
Material: 1.2-mm-thick stainless steel (SUS304)



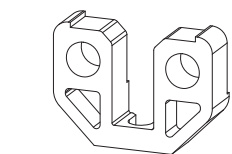
## Mounting Bracket for M3-mounting Flat Sensors E39-L167



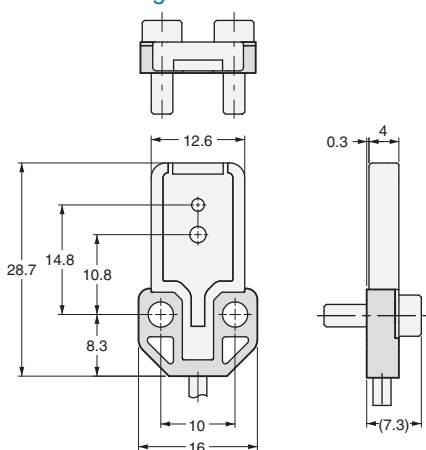
Material: 1.5-mm-thick stainless steel (SUS304)



## Back-mounting Spacer for M3-mounting Flat Sensors E39-L168



Material: PBT (polybutylene terephthalate)



Note: Use this Spacer when mounting the Sensor from the back.

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